Configuring Dial Services

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Site Manager Software Version 5.0

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Bay Networks

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About This Guide

If you are responsible for configuring and managing Bay Networks™ routers or BNX® platforms, you should read this guide to discover how to customize Bay Networks router software for dial-on-demand, dial backup, and bandwidth-on-demand services.

This guide, *Configuring Dial Services*, offers

- An overview of all three dial services (Chapter 1)
- An overview of ISDN communication, used with each dial service (Chapter 2)
- Implementation notes that may affect how you configure each dial service (Chapter 3 through Chapter 6)
- Instructions on editing dial service parameters (Chapter 7 through Chapter 12)

Software Suites

Routing and Switching software is available in the following suites:

- The *System Suite* includes IP routing, 802.1 Transparent Bridge, Source Route Bridge, Translation Bridge, SNMP Agent, Bay Networks HDLC, PPP, OSPF, EGP, BGP, and basic DLSw.
- The *LAN Suite* includes DECnet Phase 4, AppleTalk Phase 2, OSI, VINES, IPX, and ATM DXI, in addition to the System Suite.
- The *WAN Suite* includes ATM DXI, Frame Relay, LAPB, and X.25, in addition to the System Suite.
- The *Corporate Suite* includes the System, LAN, and WAN suites in their entirety.

- The *ARE ATM Suite* provides RFC 1483 and 1577 compliance, ATM UNI 3.0 signaling, in addition to the LAN Suite.
- The *ARE VNR Corporate Suite* provides ATM Forum LAN Emulation, in addition to the ARE ATM Suite and Corporate Suite.
- The *BNX Suite* includes IP Routing, SNMP Agent, Bay Networks HDLC, PPP, OSPF, EGP, BGP, File-Based Performance Statistics, Frame Relay switching, and Frame Relay billing, and selected components from the Corporate, ARE ATM, and ARE VNR Corporate suites.

Availability of features and functionality described in this guide depends on the suites you are using.

Audience

Written for system and network managers, this guide presents instructions on how to configure the Bay Networks implementation of each dial service to suit your environment.

We assume that you are familiar with switched networks and are aware of the products and services that your company purchased from your service provider.

Before You Begin

Before you use this guide, retrieve the configuration file in local, remote, or dynamic mode.

Refer to *Configuring Routers* or *Configuring Customer Access and Trunks (BNX Software)* for instructions.

Conventions

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: if command syntax is **ping** *<ip_address>*, you enter **ping 192.32.10.12**
bold text	Indicates text that you need to enter, command names, and buttons in menu paths. Example: Enter **wfsm &**
	Example: Use the **dinfo** command.
	Example: ATM DXI > Interfaces > **PVCs** identifies the PVCs button in the window that appears when you select the Interfaces option from the ATM DXI menu.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
quotation marks (“ ”)	Indicate the title of a chapter or section within a book.
`screen text`	Indicates data that appears on the screen. Example: `Set Bay Networks Trap Monitor Filters`
separator (>)	Separates menu and option names in instructions and internal pin-to-pin wire connections. Example: Protocols > AppleTalk identifies the AppleTalk option in the Protocols menu.
	Example: Pin 7 > 19 > 20
vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is
	show at routes | **nets**, you enter either **show at routes** or **show at nets**, but not both.

Acronyms

AURP	AppleTalk Update-based Routing Protocol
BRI	Basic Rate Interface
BofL	Breath of Life
CHAP	Challenge Handshake Authentication Protocol
CSU	channel service unit
DLCMI	Data Link Control Management Interface
DLCI	Data Link Control Identifier
DSL	Digital Subscriber Loop
DSU	data service unit
ET	exchange terminator
HDLC	High Level Data Link Control
IP	Internet Protocol
IPX	Internet Packet Exchange
ISDN	Integrated Services Digital Network
ITU-T	International Telecommunications Union–Telecommunications
LAPD	Link Access Protocol-D
LCP	Link Control Protocol
LQR	Link Quality Report
LT	line terminator
NT	network terminator
PAP	Password Authentication Protocol
PPP	Point-to-Point Protocol
PRI	Primary Rate Interface
PSTN	Public Switched Telephone Network
PVC	permanent virtual circuit
RIP	Routing Information Protocol
SAP	Service Advertising Protocol
SAPI	service access point identifier
SPID	Service Profile Identifier
SVC	switched virtual circuit
TA	terminal adapter

TE	terminal equipment
TEI	terminal endpoint identifier
WAN	wide area network
XNS	Xerox Network System

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For assistance with noncritical network support issues, Bay Networks Information Services maintain an active forum on CompuServe, a global bulletin-board system. This forum provides file services, technology conferences, and a message section to get assistance from other users.

The message section is monitored by Bay Networks engineers, who provide assistance wherever possible. Customers and resellers holding Bay Networks service contracts also have access to special libraries for advanced levels of support documentation and software. To take advantage of CompuServe's recently enhanced menu options, the Bay Networks Forum has been re-engineered to allow links to our Web sites and FTP sites.

We recommend the use of CompuServe Information Manager software to access these Bay Networks Information Services resources. To open an account and receive a local dial-up number in the United States, call CompuServe at 1-800-524-3388. Outside the United States, call 1-614-529-1349, or your nearest CompuServe office. Ask for Representative No. 591. When you are on line with your CompuServe account, you can reach us with the command **GO BAYNET**.

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Sydney, Australia	(612) 9927-8800	(612) 9927-8811
Tokyo, Japan	(81) 3-5402-0180	(81) 3-5402-0173

Chapter 1
Dial Services Overview

A dial service provides access to a switched network by means of a dial-up line (also called a *switched line*). Dial-up lines are active only as-needed -- that is, when there is data to send across the network, or when a dial-up line acts as a resource for a failed or congested leased line. Dial-up lines can be a cost-effective alternative to leased lines and packet networks, which are permanent connections and therefore available regardless of network traffic.

If you send a limited amount of data or your data transmission is intermittent, dial-up lines can be less expensive than leased lines and they maximize network performance and flexibility.

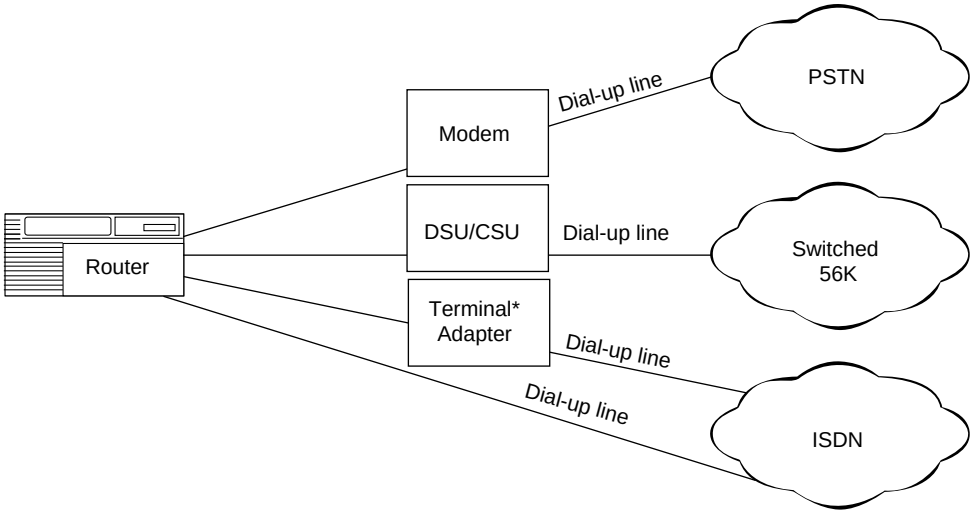
This chapter introduces Bay Networks dial services.

Bay Networks Dial Services

The router provides three types of dial services: dial-on-demand, dial backup, and bandwidth-on-demand. Each dial service serves a different purpose:

- **Dial-on-demand** service reduces your line costs by establishing a connection between two devices only when there is data to send. You do not incur the cost of a leased line that is active regardless of data traffic.
- **Dial backup** service provides a backup circuit when a leased circuit fails. The backup circuit serves as an alternative path for data to reach the destination.
- **Bandwidth-on-demand** service provides up to 29 additional lines for a congested leased line, a dial-on-demand line, or a leased multilink bundle. This provides a total of 30 lines for communication. The additional lines increase bandwidth for data traffic, improving communication and reducing network delays.

All three dial services work over public, switched networks such as a standard telephone network, a switched 56 Kb/s network, and an Integrated Services Digital Network (ISDN) (Figure 1-1).



*You only need a terminal adapter if your router does not have built-in ISDN capability. If your router has an ISDN/BRI module or an MCT1 or MCE1 Link Module installed, along with ISDN software, you can connect to an ISDN network directly.

DS0005A

Figure 1-1. Example of Dial Access to a Switched Telephone Network

The router initiates, monitors, and terminates dial-up connections using either a dial device (modem, ISDN terminal adapter) that supports Raise DTR, V.25bis, or a router with an internal ISDN interface connected to an ISDN network. An internal ISDN interface eliminates the need for external dial devices. If the router has built-in ISDN capability, you can connect to an ISDN network directly.

Note: Basic Rate Interface (BRI) service requires a network terminator 1 (NT1) to connect to an ISDN network. The router's built-in BRI module does not include an internal NT1, so you or your service provider must supply it.

Dial-on-Demand Service

Dial-on-demand enables you to establish a network connection only when the router has data to send across the network, or when you dynamically configure the router to establish a connection. By using the dial-up lines, you significantly reduce the high costs associated with using leased lines, which connect remote locations even if there is no data to transmit or receive.

To implement dial-on-demand, the router establishes a demand circuit (that is, the logical connection) over a physical line. The router establishes a demand connection for any one of the following reasons:

- The router has data to send across the circuit.
- You specify a time of day to activate the circuit.
- You enable the Force Dial parameter, which instructs the router to force a connection.

The router brings down the circuit when

- The configured inactivity time expires.
- You schedule a time of day to take the circuit down.
- You enable the Force Take Down parameter, which instructs the router to force the termination of a connection.

Refer to "Activating Demand Circuits" for more information.

Dial-on-demand is supported on asynchronous (RS449), synchronous (RS449, V.35, RS422, and X.21) and ISDN interfaces. Figure 1-2 shows a demand line connecting two routers. When the router has data to transmit or when you configure the router to bring up a demand circuit, the router instructs the dial device to establish a connection.

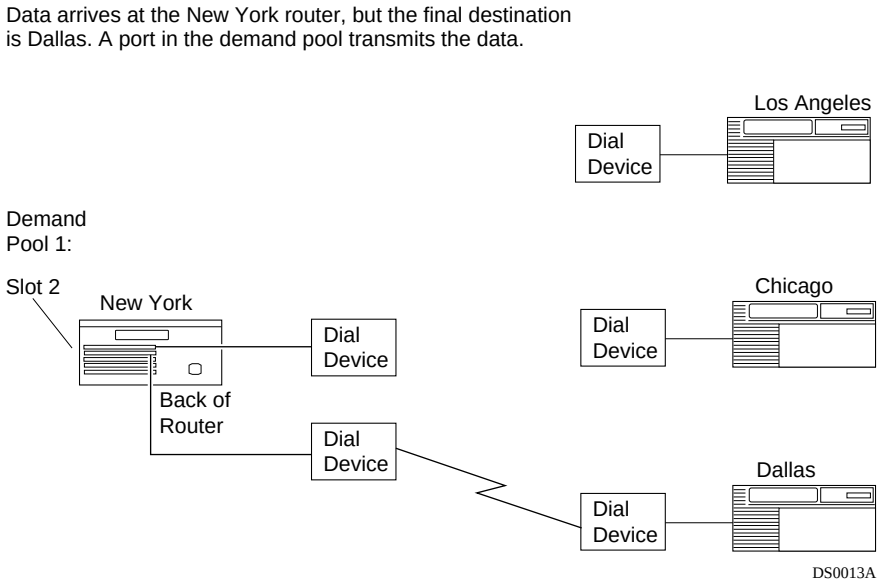


Figure 1-2. Dial-on-Demand Service

Demand Lines and Pools

Demand lines provide the physical connections over which the demand circuits transmit and receive data. To maximize the number of circuits that can be active simultaneously, you establish a *demand pool.*

A demand pool is a group of one or more lines that reside in the same slot on the router. You identify each demand pool by assigning a *demand pool ID*. Lines in a demand pool can connect to a modem or directly to an ISDN network (using a router with integral ISDN capability).

You can combine asynchronous, synchronous, and ISDN interfaces in a single pool. The asynchronous and synchronous interfaces can use Raise DTR or V.25bis signaling, while the ISDN lines use ISDN signaling. The router automatically configures the Point-to-Point Protocol (PPP) for demand circuits.

How Demand Lines, Pools, and Circuits Work Together

When you create demand circuits, you assign a demand pool ID to each circuit. Note that many demand circuits can use the same demand pool and, therefore, can use the same lines in that pool. The line itself does not have a specific network address; it is the circuit that has the associated network address.

When the router has data to send across a demand circuit, that circuit searches for an available demand line from its associated demand pool.

When it finds an available line, the router then establishes a dial-up connection to the remote router. The router terminates the connection when the router stops sending or receiving data, when you manually take down the connection, or when the configured time interval for an active connection expires.

Figure 1-3 shows the relationship between demand lines, pools and circuits.

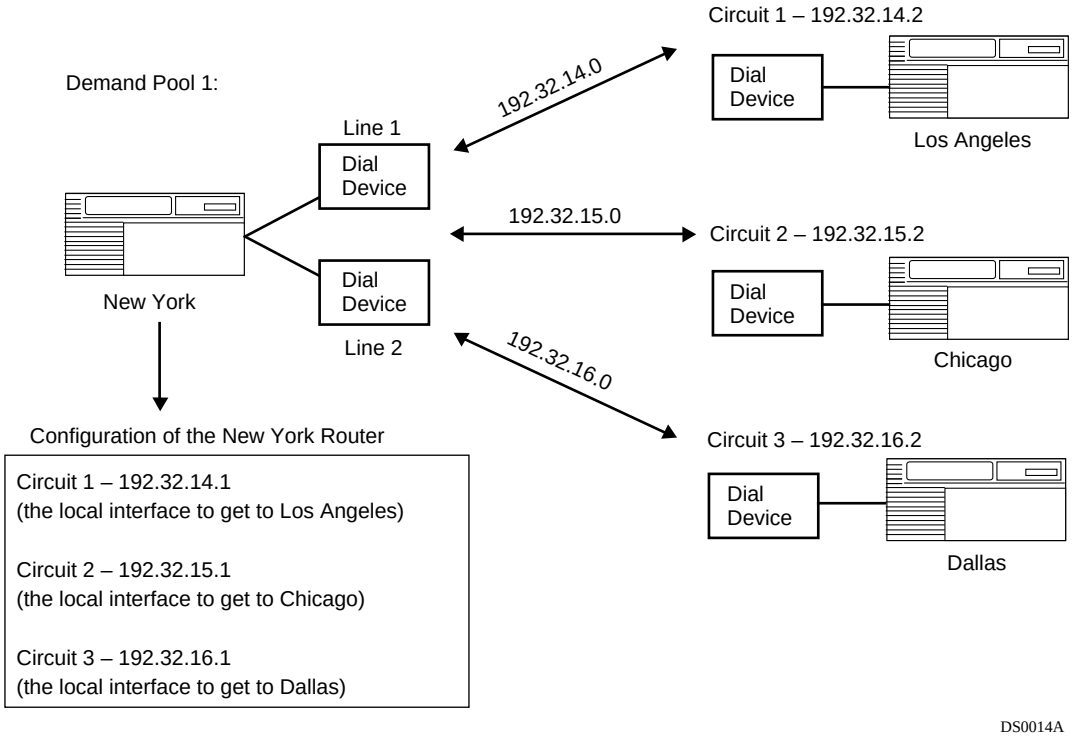


Figure 1-3. Example of Demand Pools and Circuits

In Figure 1-3, three circuits share two physical lines that make up Demand Pool 1. Note that only two of the circuits using Demand Pool 1 can be active simultaneously because only two modems are available. The IP addresses are associated with each circuit, not with the physical line.

In addition to assigning a demand pool ID to each circuit, you can also assign phone lists (for use with V.25bis and ISDN dialing) and protocol interfaces. You can read about these options later in this manual.

Activating Demand Circuits

The router activates a demand circuit under one of three conditions:

- The router has data to send across the circuit.

  When the router has data to transmit, it automatically selects one of the demand lines from the circuit's associated demand pool. As long as data is going across the line, the end-to-end connection remains active.

- You enable the Force Dial parameter.

  To activate a line immediately, you configure the Force Dial parameter. Using this parameter, you force the router to initiate a connection regardless of whether there is data activity. To configure this parameter, refer to Chapter 8.

- You specify a time of day to activate the circuit.

  Using the Schedule option, you can schedule the circuit's availability for a specific day and time. The schedule parameters are part of the circuit's configuration (refer to Chapter 8). The Schedule option also allows you to configure whether the router uses the Inactivity Time parameter to dynamically deactivate the connection.

Adding Bandwidth for Demand Lines

To provide more bandwidth for a congested demand line, you can use up to 29 additional lines from an existing bandwidth-on-demand pool, providing a total of 30 lines for communication. Adding bandwidth to aid a demand line benefits time-critical applications that rely on data reaching its destination efficiently.

The router determines that the demand line is congested when the traffic over the line exceeds a certain user-configured threshold. The router--configured as the congestion monitor--then searches for an available line from the bandwidth-on-demand pool that you associate with this demand circuit.

Lines in a bandwidth pool can reside across slots, so you need to designate each slot as either *preferred* or *reserved*. This designation determines the order of slots that the router searches for available lines; the preferred slot is first and the reserved slot is second. If these slots have no available lines, the router automatically uses the *local* slot. The local slot is the slot containing the first leased line that came up. Once the router activates additional lines, they adopt the configuration of the congested demand circuit.

PPP multilink is the protocol that enables the router to use multiple lines simultaneously to transmit data. Multilink enables the router to use lines at different speeds and to evenly distribute data across those lines. When you enable multilink, you can configure a set of links between two peers into a single *bundle*. The actual number of lines in a multilink bundle depends on hardware platform constraints, total bundle speed, the speed of each link in the bundle, and the type of traffic you are sending. For more information about PPP multilink, refer to Chapter 6.

Figure 1-4 illustrates the addition of two switched lines to provide more bandwidth for a congested demand line.

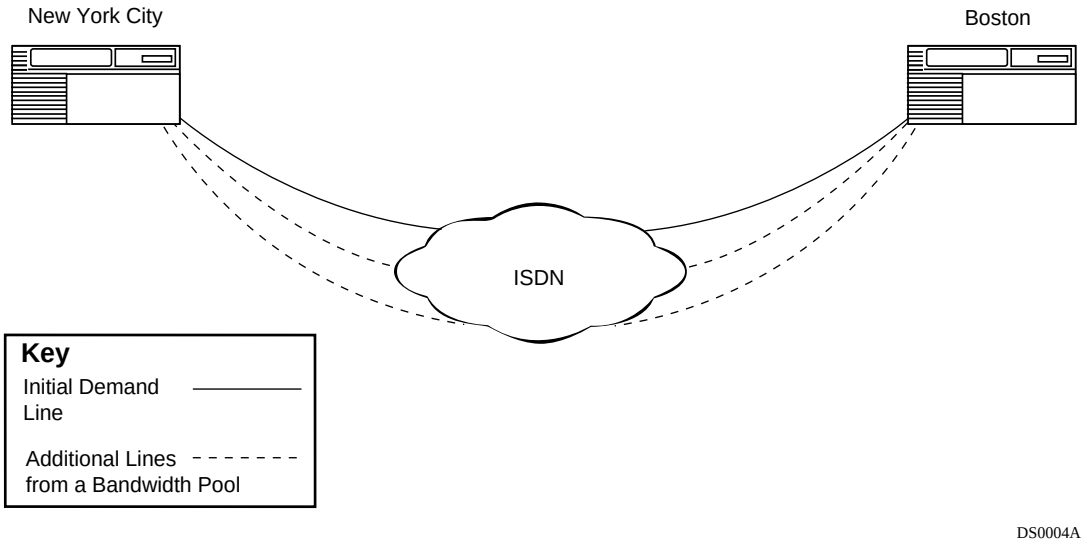


Figure 1-4. Additional Lines for a Dial-on-Demand Connection

Terminating Demand Circuits

The router deactivates the demand circuit under one of the following conditions:

- The inactivity time expires.

  To deactivate the connection, you can configure the Inactivity Time parameter, which dynamically terminates the connection after a specified amount of time elapses without data activity. If there is data going across the line, the inactivity timer resets and the connection remains active.

  To ensure that a connection is not up longer than necessary, you can configure traffic filters that allow specific types of data to go across a line without resetting the inactivity timer.

Note: The router does not consider PPP's Link Quality Report (LQR), Link Control Protocol (LCP), and periodic CHAP messages as data, so they do not reset the inactivity timer.

- You enable the Force Take Down parameter.

  To deactivate a force dial connection, you configure the Force Take Down parameter, which instructs the router to clear the connection. To learn how to configure this parameter, refer to Chapter 8.

- You schedule the circuit to come down.

  Using the Schedule option, you can schedule the circuit's availability for a specific day and time. The schedule parameters are part of the circuit's configuration (refer to Chapter 8). The Schedule option also allows you to configure whether the router uses the Inactivity Time parameter to dynamically deactivate the connection.

Dial Backup Service

Dial backup service lets you configure backup lines for failed primary lines. A *primary line* is a leased line, a leased multiline (Standard and PPP only), or a leased multilink connection. This leased line acts as the physical connection over which the leased circuit, the logical connection, carries traffic. You designate these leased circuits as *primary circuits*. This designation tells the router to provide backup service if the primary line and circuit fail.

If a primary circuit fails and you configure dial backup service for that circuit, the router activates an available backup line. When the primary circuit is restored, the router reroutes all traffic from the backup to the primary and clears the dial backup connection.

Dial backup is supported on asynchronous lines, (RS449), synchronous lines (RS449, V.35, RS422, and X.21) and on ISDN interfaces.

Table 1-1 lists what you can configure as primary and backup lines.

Table 1-1. Primary and Backup Lines

Line	Type
Primary	Any leased line up to T1/E1 rates, including multiline (Standard and PPP only) and multilink connections. Frame Relay multiline circuits cannot be dial backup primaries.
	Frame Relay PVCs
Backup	Any WAN line including ISDN B channels. Lines must be in the dial backup pool.

Table 1-2 lists the protocols for each type of primary and backup circuit.

Table 1-2. Primary and Backup Circuit Protocols

If the primary circuit's protocol is:	The backup circuit's protocol can be:
Standard	Async or Sync PPP only
PPP	Async or Sync PPP only
Frame Relay -- backing up only one PVC	Async or Sync PPP only
Frame Relay -- backing up the entire Frame Relay interface	Frame Relay only

Circuit Backup Versus Link Backup

When you select PPP or Frame Relay for the backup circuit, you are determining whether the router performs *circuit backup* or *link backup*.

Circuit backup describes a point-to-point backup connection. One circuit is backed up at a time instead of an entire interface. When you back up a point-to-point primary circuit (Standard, PPP, or a single Frame Relay PVC), the protocol over the backup circuit is PPP.

Figures 1-5 and 1-6 show examples of circuit backup. Figure 1-5 shows a Standard primary aided by a PPP backup circuit. Figure 1-6 shows a PPP primary circuit aided by a PPP backup circuit.

Note: For circuit backup of a single Frame Relay PVC, the backup line passes only through the switched network, going around the Frame Relay network.

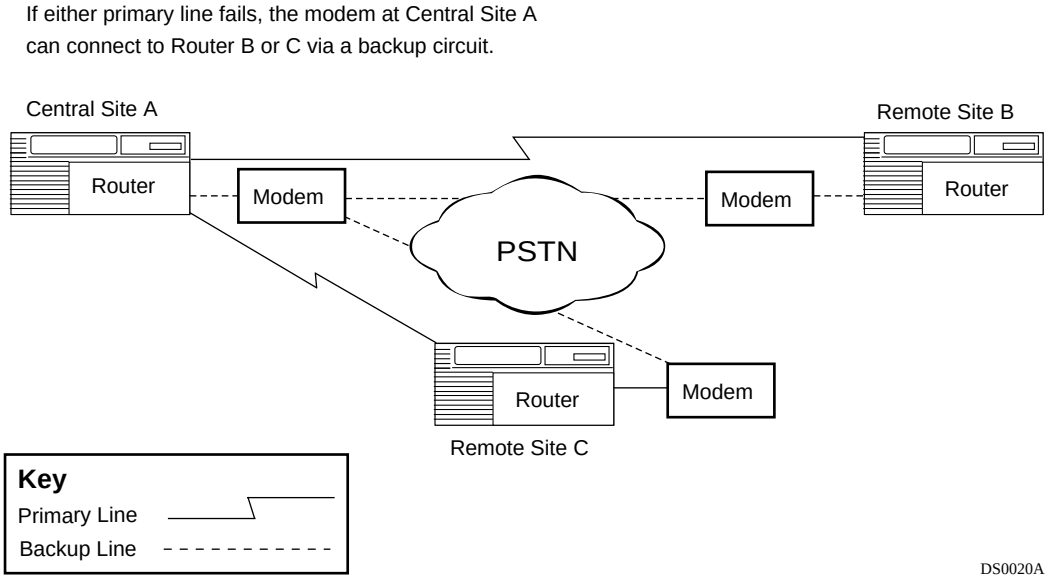


Figure 1-5. PPP Backup Across a Public Switched Telephone Network (PSTN)

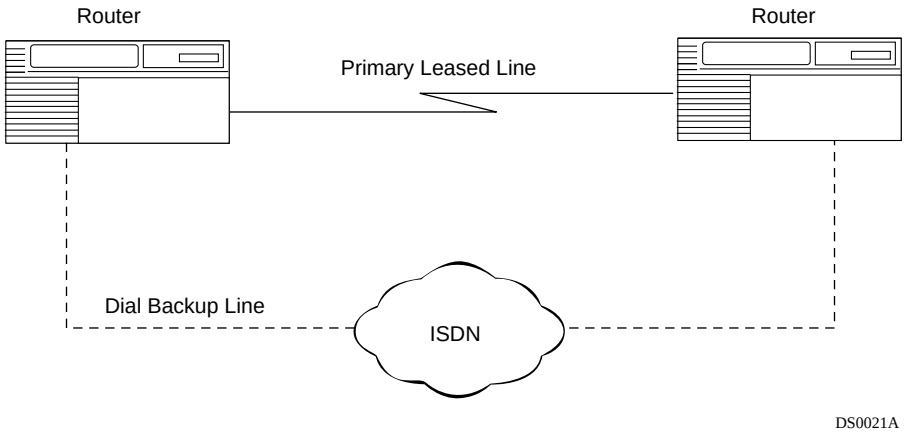


Figure 1-6. PPP Backup Across an ISDN Network

Link backup is a multiple-circuit backup, which means that the entire interface is backed up. To back up all PVCs for a Frame Relay interface, you configure Frame Relay across the backup circuit.

Figure 1-7 shows an example of link backup.

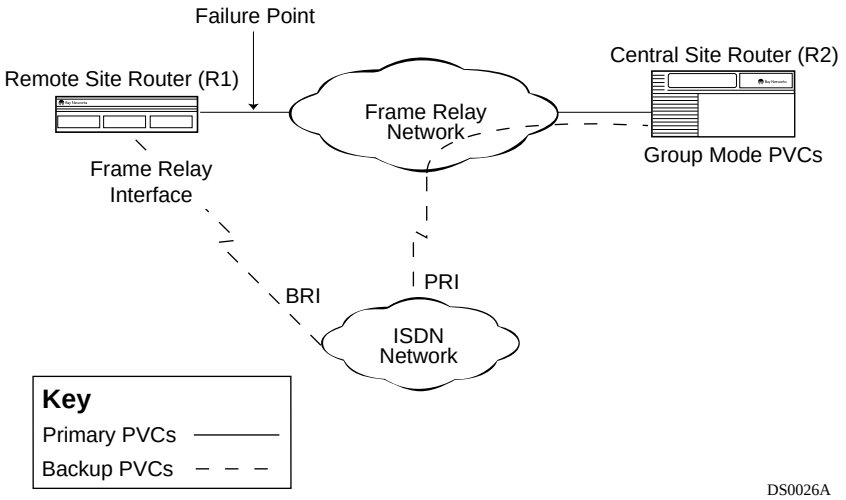


Figure 1-7. Frame Relay Backup Across a Frame Relay Network

In Figure 1-7, if the Frame Relay link fails at router R1, the router activates a backup connection through the ISDN network then back through the Frame Relay network to the destination. The backup connection to the Frame Relay network uses a different network interface and PVCs than the primary connection. Once the primary line recovers and the Frame Relay switch responds to router R1's Data Link Control Management Interface (DLCMI) status requests, router R1 terminates the backup connection.

Note: A primary circuit cannot use link and circuit backup simultaneously.

Knowing When the Primary Line Failed

The router "knows" that a primary line failed in one of three ways, depending on the protocol for the primary and backup circuits:

- No Breath of Life (BofL) messages in the BofL time period (Standard and PPP)

  For Standard and PPP, Site Manager automatically enables BofL messages on each primary circuit and disables them on each backup circuit. BofL messages verify that the line is operational. The router determines the primary failed when the it stops receiving packets within the BofL time period.

  You configure the BofL timer with the synchronous line parameter BofL Timeout. See *Configuring Line Services* for more information.

- No DLCMI messages (Frame Relay primary/Frame Relay backup)

  When Frame Relay is the protocol for the backup circuit, the router performs link backup. For link backup, the router knows that the primary failed when it no longer receives DLCMI messages from the switch. These messages communicate information about the interface and the status of each PVC.

  The router may also rely on modem signals to determine if the primary circuit failed. If you rely on modem signals, you must set the Sync Polling parameter to Enable. This instructs the router to monitor modem signals. Refer to *Configuring Line Services* for more information about the Sync Polling parameter. In addition, you must use the proper synchronous cable for connection to the primary line's modem or CSU/DSU. Refer to the *Cable Guide for Routers and BNX Platforms*.

- A-bit notification (Single Frame Relay PVC primary/PPP backup)

  If only one Frame Relay PVC is being backed up by PPP, the router performs circuit backup. For circuit backup, the Frame Relay service provider must support A-bit notification, which tells the router the status of the PVC. This enables the router to back up the PVC if it fails. Without A-bit notification, the remote end of the PVC is never notified when the local-side PVC has terminated, making backup support impossible.

Backup Lines and Pools

Backup lines provide an alternative line to carry data if the primary line fails. It is advantageous, therefore, to have one or more backup lines to ensure data transmission. To assign one or more backup lines to a primary line, you establish a *backup pool*.

A backup pool is a collection of lines the primary circuits can use. Each backup pool is identified by a *backup pool ID*.

The lines in a backup pool can reside in any slot on the router that supports WAN lines. This means the pool can span multiple slots. Lines in a pool connect to a modem or directly to an ISDN network (using a router with integral ISDN capability).

You may combine asynchronous, synchronous, and ISDN interfaces in a single pool. The asynchronous and synchronous interfaces may use Raise DTR or V.25bis signaling, while the ISDN lines use ISDN signaling.

How Backup Lines, Pools, and Circuits Work Together

For each leased circuit that needs a backup, you designate that circuit as a *primary circuit* and assign it a backup pool ID. If the primary circuit fails, the router activates the backup line to carry the backup circuit. If your network uses a multiline or multilink primary, the backup line activates when the last line in the multiline or multilink bundle fails. Note that you must first configure a leased circuit and a backup pool before you can configure primary and backup circuits.

Figure 1-8 shows how lines, pools, and circuits work together. The router in San Diego has two leased lines, one going to a router in Phoenix and the other to a router in San Francisco. The circuits for each of these destinations are associated with Backup Pool 1. If either of these leased lines fail, the San Diego router activates Backup Line 1 from Backup Pool 1 to continue routing traffic to the destination. Although there is only one line, both use this line as a backup.

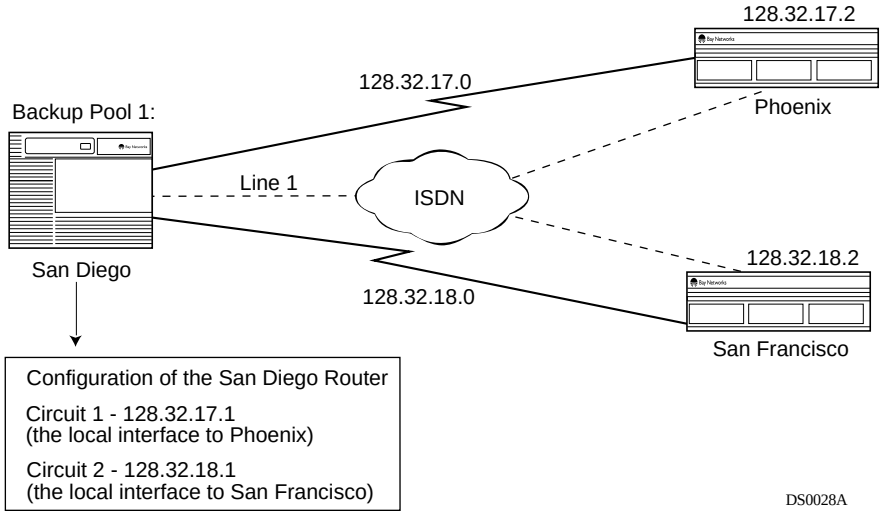


Figure 1-8. Example of Backup Pools, Lines, and Circuits

You can assign the same backup pool ID to more than one primary circuit. If you want only one backup line dedicated to a primary circuit, then you should configure only one line in a pool and assign that pool exclusively to that circuit.

The Configuration of the Backup Circuit

The configuration of the backup circuit depends on the protocol of that circuit. If Standard or PPP is running over the primary circuit, the backup circuit inherits the primary's network-layer address configuration. Unlike the network-layer address configuration, the data link-layer configuration can be unique.

If Frame Relay is running over the primary circuit, the backup circuit can inherit the primary's configuration or it can use its own configuration. When the Frame Relay primary and backup use the same configuration, it is called the *shared* configuration. The shared configuration allows a backup circuit to use the same network-layer address as the primary circuit. The data-link layer configuration, that is, the backup's PVCs, data link control identifiers (DLCIs), and filters can be the same or different from the primary circuit.

If the backup uses a unique configuration, this is called the *secondary* configuration. A secondary configuration uses a different network-layer address, PVCs, and filters from the primary for the same Frame Relay interface.

Note: You do not configure different PVCs if the backup circuit connects to a different interface at the destination. In this case, the switch informs the destination router about available PVCs.

Activating the Backup Line

When the router detects a failure on the primary line, it selects a line from a backup pool. The router activates a backup line under any one of the following conditions:

- The primary circuit is not operating.
- All of the primary circuit's lines have failed.
- An active backup line has failed.

If the backup line itself fails, an inactive backup line can replace it only if you configure multiple lines in the backup pool. If the first line fails for every phone number in the router's phone list, and the primary is still down, the router tries the next line in the pool.

Note: If you are backing up a Frame Relay primary circuit, the router, not the network, activates and terminates the Frame Relay backup connection. The router rejects incoming calls from the Frame Relay network.

Retry Attempts to Establish the Connection

If the remote site has several different telephone lines attached to individual dial units, the backup circuit uses the telephone numbers stored in the primary circuit's record to connect to the site. If one telephone number fails, the backup line attempts to connect using one of the other telephone numbers.

For V.25bis calls, the router redials the same number until its retry attempts reach the maximum retry count that you specify in the modem parameters. If the router cannot make a connection using the current phone number, it tries the next number in its phone list. It continues trying until it has gone through all the numbers, or it connects to the remote site.

For ISDN calls, the router sends a call setup message for each number in the phone list. If the router cannot make a connection using the current phone number, it tries the next number in its phone list. It continues trying until it has gone through all the numbers, or it connects successfully.

Terminating the Backup Connection

The router terminates the backup circuit when it can restore the primary circuit, the backup circuit fails, or the configured time period for the backup circuit is over. Once the router restores the primary circuit, it checks that the backup circuit is no longer active. If the backup is still active, the router terminates it.

Bandwidth-on-Demand Service

Bandwidth-on-demand service lets you configure additional dial-up lines for

- A congested leased line.
- A congested *multilink bundle*, which is a set of links between two peer routers.
- A congested dial-on-demand line.

Note: Refer to "Adding Bandwidth for Demand Lines" on page 1-6 for more information about bandwidth-on-demand service for demand lines.

When data traffic exceeds the capacity of a line or bundle, bandwidth-on-demand service alleviates congestion by adding up to 29 dial-up lines. The router can then provide a total of 30 lines for communication.

PPP multilink is the protocol that enables the router to use multiple dial-up lines simultaneously to transmit data. The actual number of lines in a multilink bundle depends on hardware platform constraints, total speed of the group, the speed of each link, and the type of traffic you are sending.

Enabling Bandwidth-on-Demand Service

The leased line, demand line, or leased multilink bundle is the physical connection over which the leased or demand circuit, the logical connection, carries traffic. The procedure for enabling bandwidth-on-demand service differs for leased circuits and demand circuits.

For a leased circuit, you select the Bandwidth on Demand option from the Dialup menu and designate the circuit as a *bandwidth-on-demand circuit* (herein referred to as a *bandwidth circuit)*. This designation tells the router to provide secondary, dial-up lines if the leased connection become congested.

For a demand circuit, the Demand Circuits window includes a BW on Demand button that lets you associate the demand circuit with an existing bandwidth-on-demand pool. It also lets you configure bandwidth-on-demand monitor parameters that determine when the demand circuit is congested.

Bandwidth-on-demand is supported on asynchronous lines (RS449), synchronous lines (RS449, V.35, RS422, and X.21) and on ISDN BRI and PRI interfaces.

Configure the leased and dial-up lines as follows:

- **Leased line --** Any single leased line or multilink bundle.
  Instead of a leased line it may be a switched dial-on-demand line.
  Protocol supported: PPP multilink.
- **Secondary dial-up lines --** Any WAN line including or ISDN B channels.
  Protocol supported: Asynchronous or Synchronous PPP multilink.

The leased lines and secondary lines may operate at different speeds.

Figure 1-9 shows how secondary lines support a leased connection.

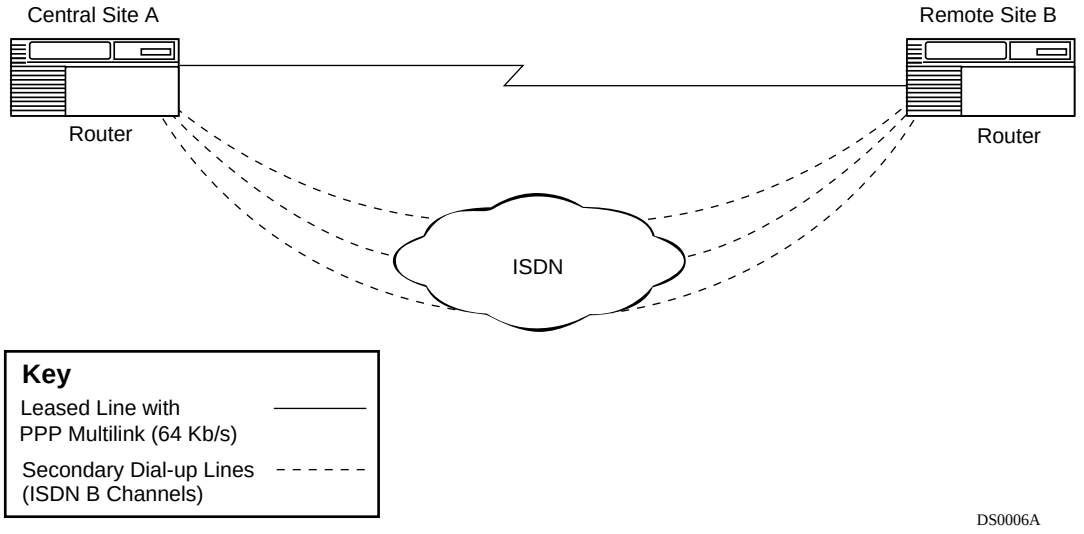


Figure 1-9. Bandwidth-on-Demand

Initially, the router brings up one secondary line to alleviate congestion. If congestion persists, the router brings up a second and then a third line until the congestion subsides. As each new line comes up, it becomes part of a bundle or group of lines. The router then balances traffic over the bundle. Once the volume of traffic decreases, the router brings down the secondary lines, one at a time.

A router at one side of the link monitors byte counts for data it sends and receives. This router is called the *congestion monitor.* The congestion monitor uses these byte counts, along with bandwidth-on-demand monitor parameters, to determine when to activate additional lines for more bandwidth. The router then uses all the available lines in the bundle to send data across the network.

Bandwidth-on-Demand Lines and Pools

A *bandwidth-on-demand pool* is a collection of dial-up lines that a congested leased line, demand line or multilink bundle can use. Each bandwidth-on-demand pool is identified by a *bandwidth-on-demand pool ID.*

In a bandwidth-on-demand pool (herein referred to as *bandwidth pool*), you may combine asynchronous, synchronous, or ISDN lines in a single pool. These lines connect to a modem or directly to an ISDN network (using a router with integral ISDN capability). The asynchronous and synchronous interfaces may use Raise DTR or V.25bis signaling, while the ISDN lines use ISDN signaling.

Lines in a bandwidth pool may operate at different speeds. PPP multilink, the protocol the router uses for bandwidth-on-demand circuits, can manage lines of varying speed, distribute traffic across lines, and monitor traffic.

When a leased line or bundle becomes congested, the router searches for an available dial-up line from its associated bandwidth pool. Lines in a bandwidth pool can reside on any slot, but out of the total slots in a pool, each secondary circuit may use only three slots.

To determine the order of slots the router searches, you designate each slot as *preferred* or *reserved*. The router uses the preferred slot first. If there are no available lines, the router uses the reserved slot. If there are still no available lines, the router automatically uses the *local* slot. The local slot is the slot containing the first leased line that came up. Once the router finds a line, it dials the destination using a phone number from the user-configured outgoing phone list.

How Lines, Pools, and Circuits Work Together

For each leased circuit or demand circuit, you assign a pool ID. If the line or bundle becomes congested, the router activates a secondary line. The secondary circuit that runs over this line inherits the configuration and protocol characteristics of the leased circuit.

You can assign the same bandwidth pool ID to more than one circuit. If you want a pool of secondary lines dedicated to one specific bandwidth circuit, assign that pool exclusively to that circuit. Remember to first configure a leased or demand connection before configuring a bandwidth-on-demand configuration.

Activating Secondary Lines

If the secondary line from the bandwidth pool does not relieve the congestion, the router adds up to 29 lines until the congestion is relieved. The router activates a secondary line only for a congested line, not for a failed line.

PPP multilink detects a state of congestion based on byte counts and the user-configurable monitor parameters. The monitor parameters let you define congestion thresholds for the leased circuit. If data traffic exceeds a threshold, the router tries activating a secondary line. Once the amount of traffic on the congested line falls below the congestion threshold, the router again uses only the leased line, demand line, or bundle. Refer to Chapter 10 for details about the monitor parameters.

Note: Byte counts are measured prior to data compression.

Terminating Secondary Lines

The router brings down secondary lines for any of these reasons:

- The leased line or multilink bundle fails.
- The leased circuit is no longer congested.
- The remote router terminates the connection.
- There is a physical problem with the dial-up line.

Example Bandwidth-on-Demand Application

In Figure 1-10, the leased line is congested due to bridge/routing protocol traffic. The BLN in Rome, designated as the congestion monitor, has determined the line is congested based on the bandwidth-on-demand monitor parameter values. Consequently, the router brings up an ISDN B channel as a secondary line.

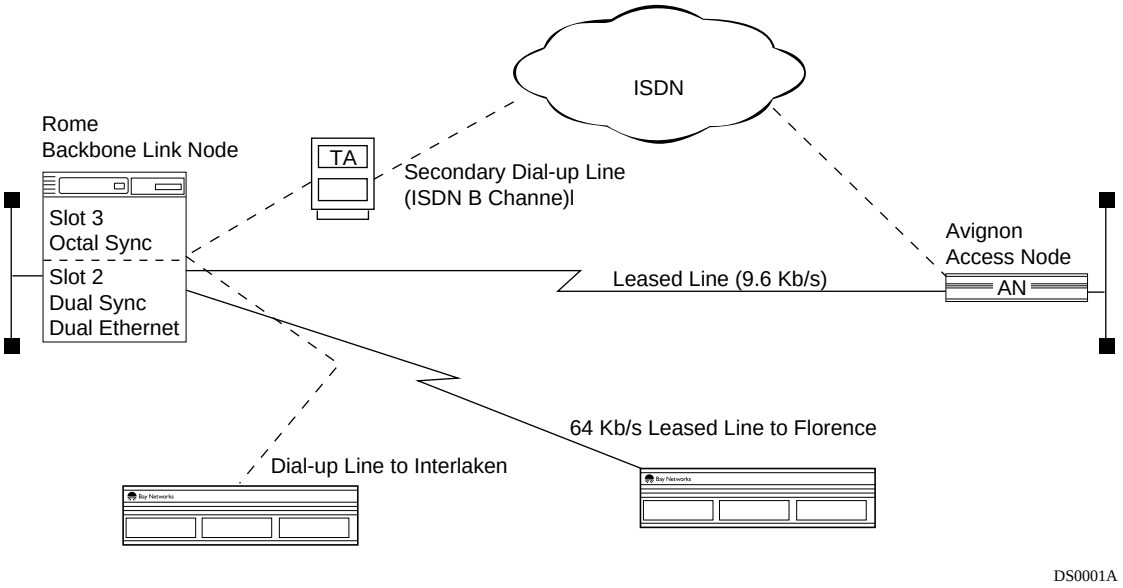


Figure 1-10. Sample Bandwidth-on-Demand Network

The congestion monitor brings down the secondary line once the level of congestion falls below the configured percentages.

In addition to serving as a secondary line for the leased line to Avignon, the B channel can also act as a backup line for the leased line from Rome to Florence and as a demand line from Rome to Interlaken.

Using the Same Lines for Different Line Pools

You can use the same physical line for a demand, backup, and bandwidth pool. For example, if the router is not using a line for a dial-on-demand connection, the router can use it for a dial backup connection.

You can tell if several pools use the same line because a combination of the letters D (demand), B (backup), and W (bandwidth) appears next to the COM connector name in the Configuration Manager window. You will not see these letters next to the MCT1/E1 connectors.

Network Access Methods and Services

There are three ways for the router to access a switched network:

- **Integrated ISDN Interface** -- A Basic Rate Interface (BRI) or Primary Rate Interface (PRI) that provides digital connectivity from the router to the destination device, replacing standard analog phone lines. Using signals on an ISDN line, the router instructs the network to set up a call to a particular destination.

  ISDN eliminates the need for dial devices such as modems, because you no longer need to convert digital signals to analog. An ISDN network also allows you to send data, voice, and video over the same digital line.

- **Raise DTR** -- A signaling method that enables access to the network by preprogramming the destination phone numbers into the dial device (modem, DSU, or ISDN terminal adapter). Raise DTR signaling works with any of these interfaces: X.21, V.35, RS-232, and RS-422.

- **V.25bis** -- A signaling method that enables access to the network by passing the destination phone numbers from the router to the dial device (modem, DSU, or ISDN terminal adapter). This method lets the dial device support dial connections to multiple destinations. V.25bis signaling works with any of these interfaces: X.21, V.35, RS-232, and RS-422.

The method you choose depends on your application, your network resources, and the type of network to which you are connecting. ISDN, a complex networking technology, requires further explanation. Refer to Chapter 2 for more information.

Chapter 2
ISDN Overview

Integrated Services Digital Network (ISDN) is an internetworking technology that integrates voice, data, and video communication over end-to-end digital connections (Figure 2-1). From an internetworking perspective, the router can use ISDN to provide LAN interconnection services over a wide area.

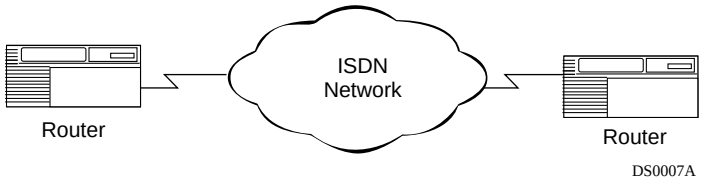


Figure 2-1. Sample ISDN Network

Because ISDN integrates services and offers multiple communication channels, it is more versatile than traditional network services that support only one channel. With ISDN, you can use the same lines and equipment for a variety of communication needs. Also, using digital lines, as opposed to analog lines, eliminates the need to convert digital to analog signals and provides faster and more accurate communication.

In addition to offering integrated services, ISDN provides a number of standard, universal interfaces to access ISDN services. With a defined set of interfaces, you can purchase ISDN equipment and services from different providers and all the parts of your network will have the same interfaces to connect to one another as well as to the ISDN network.

ISDN is primarily a dial service that uses switched connections as circuits. This means that you can use channels and services on an as-needed basis instead of having a connection up all the time, regardless of need. This choice ensures a cost-effective use of phone lines as well as bandwidth efficiency.

ISDN Standards

The ITU-T (formerly CCITT) has defined a set of standards to ensure universal implementation of ISDN technology. The next sections detail the following ISDN standards:

- Basic Rate Interface (BRI)
- Primary Rate Interface (PRI)
- The B channel
- The D channel

Basic Rate Interface

The Basic Rate Interface (BRI) transmits data at a rate of 64 Kb/s over each of two *bearer* channels, also called *B channels*, which are dedicated to data transmission. Along with the two B channels, BRI uses one *data channel* called the *D channel*. The D channel handles all signaling information such as call setup requests. It transmits this information at a rate of 16 Kb/s.

The networking industry also refers to BRI service as 2B + D, to denote the combination of the two B channels and one D channel. These three channels are combined into one physical, twisted-pair line that terminates at your premises and that provides a total of 144 Kb/s bandwidth (Figure 2-2).

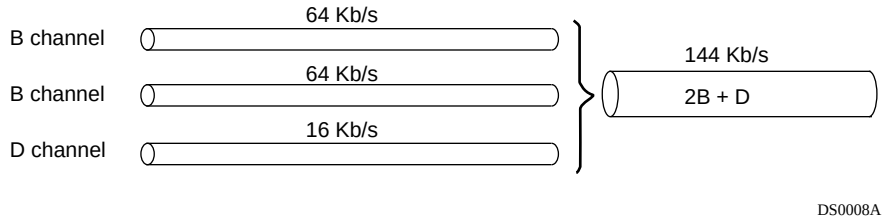


Figure 2-2. Conceptual Drawing of BRI

Primary Rate Interface

The other transmission rate service is the Primary Rate Interface (PRI). In the United States, Canada, and Japan, the PRI transmits data at a rate of 64 Kb/s over 23 B channels and sends signaling information at a rate of 64 Kb/s over one D channel (23B + D). In Europe, PRI transmits data at the same rates with 30 B channels and one D channel (30B + D). PRI channels combine into two physical, twisted-pair lines.

Two variations of PRI are necessary because the United States, Canada, and Japan derive the PRI transmission rates from the T1 standard that operates at line speeds of 1.544 Mb/s. Europe and Australia, however, use the E1 standard that operates at line speeds of 2.048 Mb/s.

The D Channel

The D channel is integral to ISDN services: It provides out-of-band signaling, which means that the line carrying signaling information is separate from the line carrying data. Using out-of-band signaling, call setup information does not interfere with the data you send, and the result is more accurate communication.

The D channel also provides what the ITU-T (formerly CCITT) defines as supplementary services. These are extra services that you can purchase from your ISDN provider, for example, calling line ID, which enables you to determine the phone number of the incoming call.

Link Access Procedure for the D Channel

To perform call setup and signaling functions between your equipment and the ISDN network, ITU-T defined recommendation Q.921, which outlines the Link Access Procedure-D (LAPD), the data link protocol for the D channel. ISDN uses LAPD to establish a switched connection on a particular B channel. The B channel then allows data to travel between the two end points of that connection.

LAPD transmits information in frames. The fields in a LAPD frame contain addresses, control, and frame-check sequence information. The address and control information comprise the LAPD header, which sequences the packets and keeps them in the right order. The frame-check sequence allows the receiver of a frame to detect any errors that may have occurred during transmission.

Unlike other data link protocols, LAPD can handle multiple users on the same multiaccess interface. Figure 2-3 shows a LAPD frame.

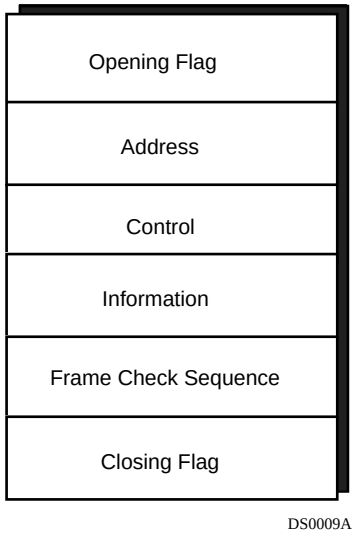


Figure 2-3. LAPD Frame

The fields in the LAPD frame are as follows:

- The **opening flag** and **closing flag** fields are High Level Data Link Control (HDLC) flags that separate one frame from the next.
- The **address** field contains two kinds of information. It provides a data-link layer entity; more specifically, a logical point that defines the data link between the user and the network. This portion of the address is the service access point identifier (SAPI). The address field also contains a number to identify the terminal equipment connected to the ISDN network. This is the *terminal endpoint identifier* (TEI). Either the network assigns a unique number to each device or you set this number at the device.
- The **control** field identifies the type of frame. This field also contains sequence numbering.
- The **information** field contains data to set up the link.
- The **frame-check sequence** is a cyclic-redundancy check.

Call Control on the D Channel

ITU-T recommendation Q.931 outlines standards for out-of-band call control at the network layer for ISDN communication. Its primary responsibility is to set up and take down ISDN calls on the B channels.

ISDN Interfaces

One of the key concepts in ISDN is a set of universal interfaces that allow you to purchase equipment and services from any ISDN provider. All providers can therefore implement ISDN similarly. ITU-T created a set of interfaces, some physical, some logical, to accomplish this goal.

ITU-T divides ISDN interfaces into two categories: functional groups and reference points. The next sections describe these two groups.

Functional Groups

Functional groups perform specific tasks that are necessary for you to access an ISDN network. These groups combine physical devices and functional points in an ISDN network, as follows:

- **Terminal Equipment 1 (TE1)** -- ISDN-compatible devices, for example, the router with an ISDN/BRI module
- **Terminal Equipment 2 (TE2)** -- Non-ISDN-compatible devices, such as analog phones, PCs, computers
- **Network Terminator 1 (NT1)** -- The point where the phone company's wires end at your premises
- **Network Terminator 2 (NT2)** -- The point where any switching services occur at your premises
- **Line Terminator (LE)** -- The point where your network lines terminate at the phone company's central office
- **Exchange Terminator (ET)** -- Located at the phone company's central office, it performs the switching exchange functions
- **Terminal Adapter (TA)** -- Provides ISDN connectivity to non-ISDN devices

Reference Points

Reference points, also called *interfaces*, bring two functions together. A reference point may be physical, along the ISDN line, or merely a conceptual point where functions merge. There are four main reference points in an ISDN network:

- **R reference point** -- The point between the non-ISDN device and a terminal adapter. It is the boundary between your equipment and the ISDN network.
- **S reference point** -- The reference point that sits between the terminal equipment and the switching device at your premises.
- **T reference point** -- The reference point that is the boundary between your switching device and the subscriber side of the local loop, that is, the wire between your phone and the phone company's central office.

Note: Any device that can connect to an S reference point can connect to a T reference point, because they are the same electrically.

- **U reference point** -- The point between the NT1 (where the phone company's line ends at your premises) and the phone company's central office. It is where the subscriber side and network side of the local loop meet.

  This point is different in North America than in Europe. In North America, the subscriber side of the local loop includes the NT1, so the U point is farther out on the network. In Europe, the NT1 is part of the provider or network side of the local loop -- so the S/T point becomes the place where the subscriber and the network meet.

Figures 2-4 and 2-5 show two ISDN networks with functional groups and reference points.

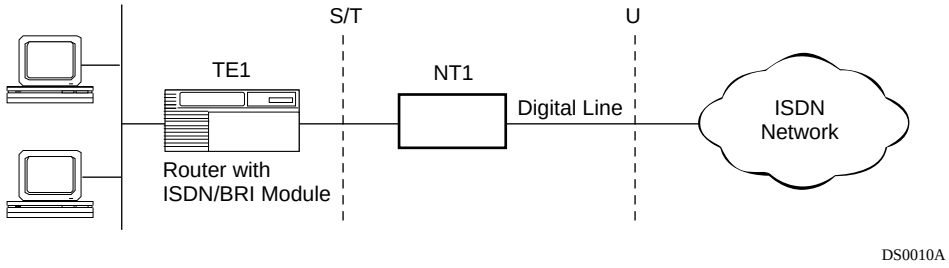


Figure 2-4. ISDN Interfaces with ISDN Devices

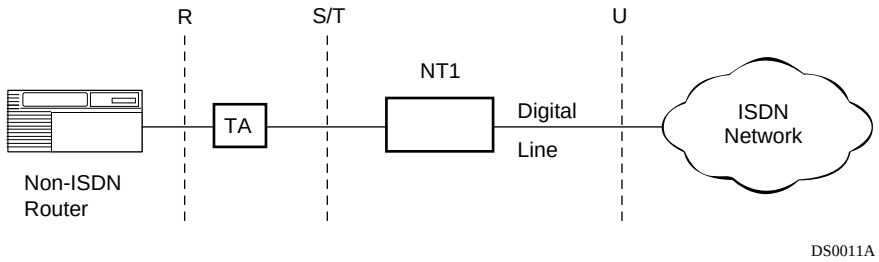


Figure 2-5. ISDN Interfaces for Non-ISDN Devices

For More Information about ISDN

The following documents provide technical details on the ISDN protocol design and implementation.

Deming, R. *ISDN -- The Network Architecture of the Future.* Bell Communication Research Technical Education Center, New Jersey.

Goldstein, F. *ISDN in Perspective*. Addison-Wesley Publishing Company, Inc., Reading, Massachusetts, 1992.

Kessler, G. *ISDN, 2nd edition*. McGraw-Hill, Inc., New York, New York, 1993.

Motorola University Press. *The Basics Book of ISDN*. Network Information Center (NIC), SRI International. Addison-Wesley Publishing Company Inc., Reading, Massachusetts, third printing, January 1994.

Newton, H. *Newton's Telecom Dictionary, 10th edition*. Flatiron Publishing, Inc., New York, New York, 1996.

Stallings, W. *ISDN and Broadband ISDN, 3rd edition.* Macmillan Publishing, Inc., New York, New York, 1995.

Stallings, W. *ISDN: An Introduction*. Macmillan Publishing, Inc., New York, New York, 1989.

Chapter 3
Implementation Notes for All Dial Services

This chapter provides information about Bay Networks implementations for all three dial services.

Point-to-Point Protocol

Site Manager automatically configures the Point-to-Point Protocol (PPP) on lines in a demand pool and bandwidth pool, including ISDN B channels. For lines in a backup pool, PPP is not automatically configured; you select it. PPP routes or bridges datagrams over point-to-point lines and runs all routing/bridging protocols that it supports. Synchronous and asynchronous interfaces use PPP.

Dial circuits use a PPP identification mechanism to identify the calling router to the called router. The identification method relies on one of two PPP authentication protocols -- Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP). These authentication protocols implement a security feature that identifies peer routers to one another.

The identification process takes place during PPP link negotiation, which occurs before the routers establish a connection to send data. It enables the destination router to identify the caller dynamically, allowing a single dial interface (ISDN or modem) at a remote router to serve as the connection point to multiple routers. For a router to identify callers, you must fill in the router's *caller resolution table*.

When you configure dial services, Site Manager automatically creates a PPP line record that all pools use. This is a generic record that a circuit uses for identification.

CHAP is the default authentication protocol. To select PAP, you must go to the PPP Interface List window, select the special line record for dial services, and specify PAP in the Local Authentication Protocol parameter. For more information about CHAP and PAP, see *Configuring PPP Services*.

Types of Authentication

You can configure *one-way authentication* or *two-way authentication*. In two-way authentication both routers can authenticate the caller. In one-way authentication, only the receiving router does the authentication.

Two-Way Authentication

Figure 3-1 shows an example of two-way authentication. For CHAP, Router A initiates a CHAP challenge, and Router B responds. Router A responds with a Response Match and the connection is activated.

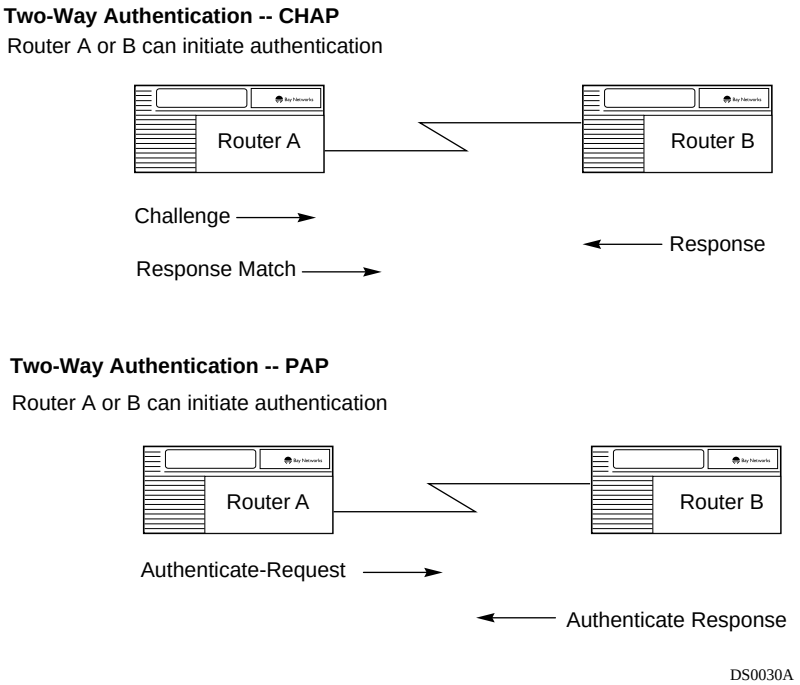


Figure 3-1. Two-Way Authentication

Both Router A and B can use PAP and CHAP in a single line pool. If Router B rejects the CHAP challenge, and Router A has the PAP Fallback parameter enabled, Router A switches to PAP and reattempts the authentication.

For PAP, Router A sends an Authenticate Request to Router B, which then responds. The connection is then activated.

One-Way Authentication

Figure 3-2 shows an example of one-way authentication. For CHAP or PAP, the router placing the call disables the authentication protocol for the circuit, while the router on the receiving side enables authentication. Although the calling router disables authentication, it still recognizes and responds to CHAP challenges or PAP authentication requests. Disabling outbound authentication enables the router to interoperate with other devices that may not support two-way authentication.

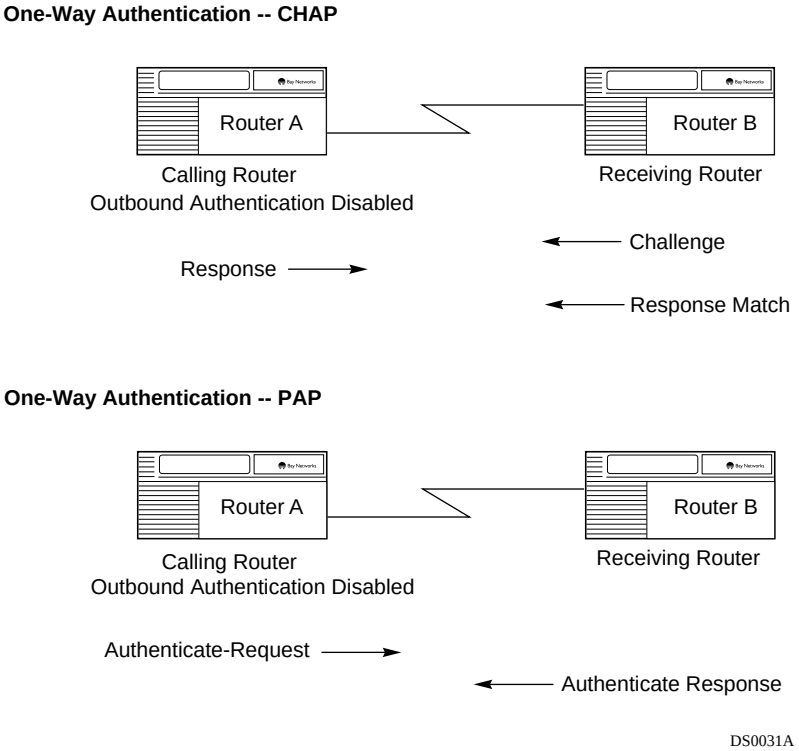


Figure 3-2. One-Way Authentication

The receiving router can use both PAP and CHAP in a single line pool. If Router A rejects the CHAP challenge, and Router B has the PAP Fallback parameter enabled, Router B switches to PAP and reattempts the authentication.

The Outbound Authentication parameter lets you configure whether the router uses one-way or two-way authentication. This parameter is in the circuit window of each dial service. Refer to the appropriate chapter for configuring circuits.

Note that for one-way authentication to work, you must enable the PPP parameter PAP Fallback. Refer to *Configuring PPP Services* for more information.

How the Router Uses CHAP Names and PAP IDs for Authentication

The authentication process takes place before the routers establish a connection. The router at one end or both ends of the connection must agree on the CHAP name and secret or PAP ID and password so PPP can determine who is calling the router and which circuit to bring up.

Figure 3-3 shows an example of how the router uses CHAP names and secrets. PAP IDs and passwords work in a similar way. The routers in this example are using two-way authentication. Routers A and B have a *caller resolution table* that maps circuit numbers to names. The routers use their resolution tables to identify the caller and to bring up a circuit.

For example, you configure Router A's table to specify that Branch_B is the CHAP name for all links between it and Router B. Router B's table indicates Branch B is associated with Circuit 5, which connects to Router A. When Router A calls Router B, it places the CHAP name, Branch B, and secret in the call setup. Router B looks in its table, confirms the name and secret, and brings up Circuit 5.

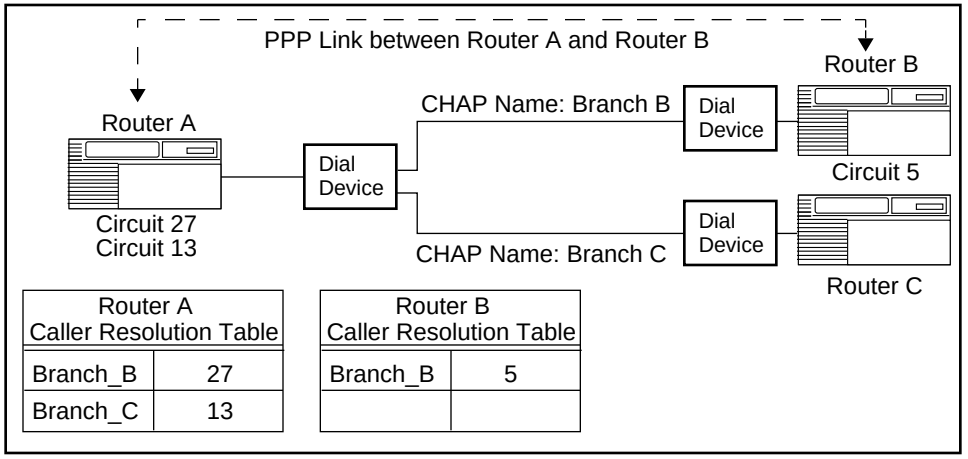


Figure 3-3. Router A Calls Router B Using CHAP

PAP is similar to CHAP; however, PAP uses a PAP ID and password as part of the identification process. The calling router places its PAP ID and password in the authenticate request message to the called router. The called router first looks at the resolution table to find the PAP ID. If the router finds the PAP ID, it then checks the table for the password associated with the ID and compares it to the password in the authenticate request message. If the passwords match, the router brings up the circuit.

To configure the caller resolution table, refer to Chapter 12. For more information about CHAP names and PAP IDs, see *Configuring PPP Services*.

Asynchronous PPP

Asynchronous PPP provides communication over asynchronous interfaces (Figure 3-4) on the AN®, ASN™ (using the Dual Sync Net Module); BLN® and BCN® (using the Octal Sync Net Module). There are several advantages to asynchronous communications:

- Low cost - Analog lines are less costly than high-speed digital lines. Asynchronous modems are less expensive than synchronous modems. Additionally, you can also dial directly into the router without using a terminal server and other port-concentration devices.
- Best use of router hardware - You can use an unused serial port on the router for a dial-up application.
- Availability of lines - Analog lines are available in most locations, enabling you to dial in from any remote location.
- Throughput - With the V.34 standard, throughput for asynchronous modems is 28.8 Kb/s. Using the V.42bis compression standard, throughput can be higher.

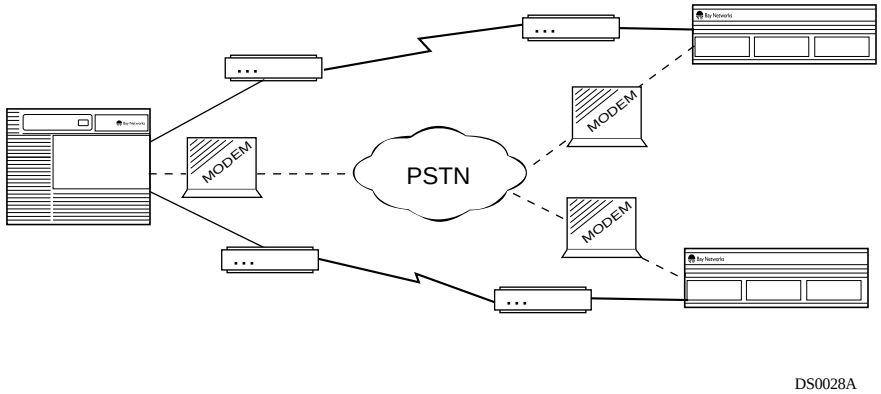


Figure 3-4. Using Asynchronous PPP Across Dial Connections

Using low-cost asynchronous modems makes asynchronous PPP ideal for customers with small networks that are trying to lower expenses. All three dial services can use asynchronous PPP for router-to-router connections. Only dial-on-demand offers support for a router calling a terminal server using asynchronous PPP.

All protocols that support PPP can operate with asynchronous PPP, including support for CHAP and PAP authentication protocols. In addition, asynchronous connections support software and hardware data compression.

IP Adjacent Hosts

If you configure IP numbered interfaces over a dial circuit, you must configure adjacent hosts to ensure that data follows the correct path.

An IP adjacent host is the next hop (that is, IP address) along the transmission path that the data must follow. For example, in Figure 3-5, the Los Angeles router is an adjacent host to the New York router.

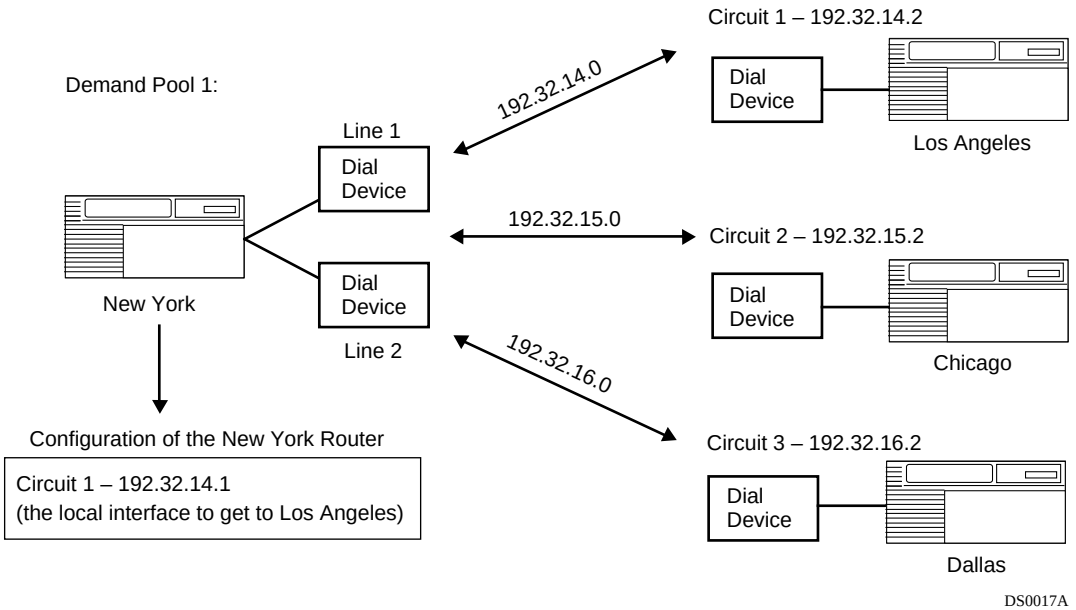


Figure 3-5. Conceptual Drawing of Adjacent Hosts

To reach the Los Angeles router, you must configure the New York router's local IP address. This address is 192.32.14.1. You must also configure the New York router's adjacent host entry, which is 192.32.14.2, the address of the Los Angeles router. These two entries designate the correct path from New York to Los Angeles.

Although you must configure IP adjacent hosts, do not configure IPX adjacent hosts. Adjacent hosts are unnecessary for IPX to work over PPP circuits.

An alternative to configuring adjacent hosts is to configure IP unnumbered interfaces. An unnumbered interface is a point-to-point connection that does not use an IP address. Instead, you configure the address to be 0.0.0.0. You can use unnumbered interfaces to advertise routing information across the network. Since all traffic over an unnumbered interface uses broadcast addressing at the link layer, you do not need adjacent hosts.

Adjacent hosts and unnumbered interfaces are features of the router's IP interface. To configure these features, refer to *Configuring IP Services*.

ISDN Services

A router with built-in ISDN capability is a TE1 device, which is an ISDN-compatible device. Your router, therefore, provides the S/T interface, which defines the user-network boundary.

For BRI service, this interface follows the standards outlined in the ITU-T recommendation I.430, the physical layer protocol that defines the S/T interface. For PRI service, the interface follows the ITU-T recommendation I.431.

You only have an S interface if an NT2 device is present. An NT2 is a switch at your site that connects your TE1 and TE2 equipment to the network.

Figure 3-6 shows the router's place in a sample ISDN network.

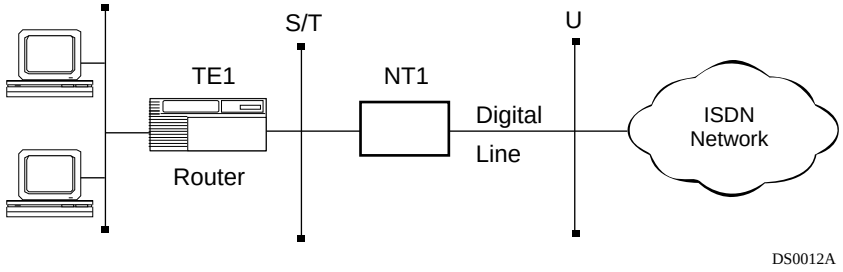


Figure 3-6. Router in an ISDN Network

The following sections detail ISDN operation on your router.

BRI Service on the AN, ANH, and ASN

The Access Node (AN), Access Node Hub (ANH™), and Access Stack Node (ASN) support the BRI standard for ISDN using an integrated ISDN/BRI module.

The integral ISDN BRI functionality allows you to connect directly to the ISDN network, as opposed to connecting via a terminal adapter. With BRI support, you reduce equipment costs and simplify connections to an ISDN switch.

The BRI implementation supports all three dial services. In addition, the implementation supports an ISDN leased-line application (only for Germany). Later chapters in this book describe how to configure each service for connection to an ISDN network.

B Channel Support

In keeping with the BRI standard, each port on the ISDN/BRI module provides two 64 Kb/s B channels for data transmission, allowing communication with two remote locations simultaneously.

D Channel Support

The router supports full 16 Kb/s D channel signaling and call setup and tear down between the router and ISDN switch. The D channel implementation complies with ITU-T (formerly CCITT) 1988 recommendations Q.921 and Q.931, with signaling support for the following countries:

- INS-64, KDD, and NTT for Japan
- TS013 for Australia
- National ISDN 1, AT&T 5ESS Custom, and NT DMS-100 Custom for the United States, Canada
- Swissnet 3 for Switzerland
- NET3 for: Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom

Bay Networks implementation does not allow you to send data across the D channel.

BRI Leased-Line Operation for Germany

For BRI service in Germany, the router allows you to support a permanent, point-to-point ISDN connection over a B channel without having to use the D channel to dial the call. This connection operates like a leased line. This option is useful when ISDN service providers do not use the D channel.

Leased-line operation supports PPP, Bay Networks Standard, and Frame Relay protocols.

Site Manager allows you to select leased-line operation when you configure the application mode for your BRI interface. Refer to Chapter 7 for more information.

BRI Subaddresses

The ITU-T specifies that the same S/T interface can have eight different TE devices, for example, routers. However, the service provider may assign only one phone number for the customer-side of the local loop. To determine the specific destination of the call, the router uses a *subaddress*.

Each router has an assigned subaddress for which it will accept calls. The subaddress must be part of the incoming call setup message sent to the router. Based on the subaddress, the router determines if the call is intended for it. If not, it ignores the call.

Floating B Service for the AN and ANH

If your ISDN service provider only offers 2B + D service, the floating B option for the AN and ANH enables you to use only one B channel for dial service applications. Floating B is an alternative if you cannot purchase 1B + D service.

Prior to the floating B option, if your service provider offered only 2B + D service, the AN and ANH CPU would use two of its four Serial Communications Controllers (SCCs) for the two B channels, one SCC for the Ethernet link, and one SCC for a synchronous link. With floating B, you use only one B channel at a time, freeing up an SCC for an additional synchronous link.

You can use Floating B if your network integrates a dial backup application that uses ISDN B channels with network devices that send protocol traffic such as SDLC or X.25. This type of application requires the following interfaces:

- One synchronous interface for SDLC, X.25 traffic
- One synchronous interface for the primary link to the backbone network
- One ISDN B channel for the dial backup link

Using 2B + D service without configuring floating B, the AN provides only one synchronous interface, so you cannot integrate the dial service with other network applications. However, by configuring floating B, you can configure two synchronous interfaces, one Ethernet link, and one B channel. The router software maps whichever B channel is in use to a single SCC.

To implement floating B operation, select **Dialup - Floating B** as the Port Application Mode (refer to Chapter 7). This ensures that the router makes the necessary adjustments for the use of only one B channel.

PRI Service on the ASN, BLN, and BCN

The Access Stack Node (ASN), Backbone Link Node (BLN), and Backbone Concentrator Node (BCN) support the PRI standard for ISDN using the following modules:

- 120 ohm Single Port MCE1-II Net Module (ASN only)
- Single or Dual Port MCT1 Link Module (BLN and BCN only)
- 120 ohm Single or Dual Port MCE1-II Link Module (BLN and BCN only)
- QMCT1 Link Module (BLN and BCN only)

The integrated ISDN PRI functionality allows you to connect directly to the ISDN network, rather than connect via a terminal adapter. PRI becomes a cost-effective solution when the number of BRI channels required for an application exceeds the cost of a single PRI line. The cost savings depends on each country’s tariffs.

The PRI implementation supports all three dial services. Later chapters in this book describe how to configure each service to connect to an ISDN network.

B Channel Support

In keeping with the PRI standard, each port on the MCT1 Link Module provides 23 B channels operating at 64 Kb/s for data transmission. Each port on the MCE1 Link Module provides 30 B channels also operating at 64 Kb/s for data transmission.

D Channel Support

The router supports full 64 Kb/s D channel signaling as well as call setup and tear down between the router and ISDN switch. The D channel implementation complies with ITU-T (formerly CCITT) 1988 recommendations Q.921 and Q.931, with signaling support for the following switches:

- Net5 for Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, United Kingdom, Switzerland, Finland, Greece, Iceland, Ireland, Luxembourg, Portugal
- AT&T 5ESS and 4ESS Custom and DMS-100 Custom for the United States
- DMS-100 Custom for Canada
- NTT and KDD for Japan
- TS014 for Australia

Bay Networks implementation does not allow you to send data across the D channel.

Selective PRI Service

Your ISDN provider may offer a service option using only a fixed number of PRI B channels out of the full complement of B channels. This fixed number of channels is offered at an economical rate.

The ISDN switch provider limits the number of channels by keeping the unavailable channels busy. Consequently, the router can use only what is available.

If you select this option, Site Manager enables you to select only those available channels for communication. For example, if the provider offers channels B1 through B6, you select only channels 1 through 6 in the PRI Timeslots configuration window (Chapter 7). You should not select all the B channels. Your configuration should match your service.

PRI Multirate

PRI multirate enables you to group B channels in multiples of 64 Kb/s to dynamically allocate bandwidth on a call-by-call basis. Depending on how many B channels you combine, the bandwidth can range from 128 Kb/s to 1472 Kb/s. This allows you to choose the most suitable bandwidth for an application.

Applications such as dial backup and video conferences, benefit from the flexibility of multirate service. These applications require more than a single B channel but less than the full compliment of B channels for a PRI interface. Also, service providers offer multirate service at low tariffs relative to other ISDN services, which makes it a good option for many applications.

Multirate is especially useful where Frame Relay is used across an ISDN line. You can group multirate dial lines to provide backup connections if the primary connection fails.

Multirate service is available for all three dial services on the BLN and BCN, using only the Dual or Single Port MCT1 and QMCT1 Link Modules. The following switches for North America and Canada support multirate service:

- 5ESS
- 4ESS
- DMS 100

For these switches, you can group 2 to 23 B channels, supplying bandwidth from 128 Kb/s to 1472 Kb/s.

Placing Multirate Calls

Multirate call setup across the D channel is simple. You set up a call only once no matter how many B channels are in use. Both ends of a connection need to support multirate for it to work.

You can place several multirate calls over the same PRI interface; however, the total number of B channels for each call cannot exceed the number of lines in the pool or the number of lines supported by the network switch. If there are no available B channels in the line pool, the call fails.

Each call can operate at a different transmission rate, which is determined by the number of B channels that you configure for each circuit and the outgoing phone number.

If you configure multirate for bandwidth-on-demand service, you must configure each line's external clock speed. Line speed is critical to balancing traffic across a multilink bundle, which is a group of switched lines that aids a congested leased line.

Call Screening

Call screening is a security feature that works with calling line ID, a service that you purchase from your ISDN provider. Call screening lets the router filter incoming calls based on the calling party's phone number. This feature is available for BRI and PRI service.

Caution: To use call screening, you must purchase calling line ID service. If your ISDN provider does not offer calling line ID and you enable call screening, the router rejects all incoming calls.

When you enable call screening, the router filters incoming calls based on a list of phone numbers that you create. If the phone number is included in the router's list, it accepts the call. If not, it does not answer the call. This ensures that only authorized users have access to your network.

To activate call screening on your router, you enable the incoming filter function (refer to Chapter 7) and specify a list of incoming phone numbers (refer to Chapter 11).

Rate Adaption

Rate adaption enables the router to accommodate data transmitting at a rate of 56 Kb/s over a 64 Kb/s B channel. Bay Networks only supports 56 Kb/s adapted to 64 Kb/s using the ITU-T V.110 type of rate adaption. You can enable rate adaption for BRI and PRI service.

For incoming calls, the router automatically adapts the data received at 56 Kb/s to the 64 Kb/s channel based on information in the call setup packet. For outgoing calls, the router sets the rate to either 64 Kb/s or 56 Kb/s, depending on how you configure the rate adaption parameters.

To determine which rate you select, ask the service provider for information about the network and the connection of the destination device. For information about configuring rate adaption, refer to Chapter 7 and Chapter 11.

The following two examples describe how rate adaption works.

Example 1

Between two end nodes, there are seven switches, one of which uses a 56 Kb/s trunk line (Figure 3-7). To accommodate this switch, the router sends data at 56 Kb/s over the 64 Kb/s line that connects the switch to the network. To do this, the router drops one of the 8 bits of data from each byte and sends only 7 bits of useful data at a time.

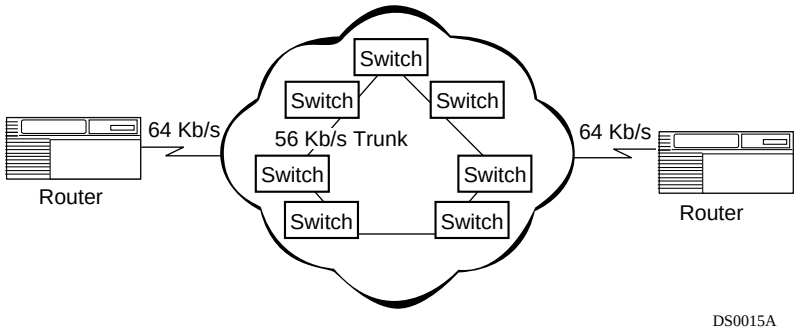


Figure 3-7. Rate Adaption for a Network with a 56 Kb/s Trunk Line

Example 2

For a connection between an ISDN and Switched 56 Kb/s network (Figure 3-8), the router adapts the data rate for the outgoing call to 56 Kb/s to meet that of the destination device, which can handle data only at 56 Kb/s. To effect this, set the outgoing phone number's Adaption Rate parameter to 56 Kb/s.

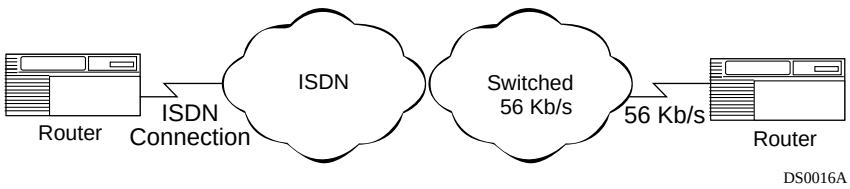


Figure 3-8. Rate Adaption for a Switched 56 Kb/s Network

Using the ping Command for ISDN Connections

To check the availability of a remote device in an ISDN network, you can use the **ping** command. The **ping** command sends an Internet Control Message Protocol echo request to a remote address that you specify. You can send this command using Site Manager's Administration option, Ping from Router, or by using the Technician Interface.

Call setups for dial connections require more time than setups for ISDN connections. When you ping a remote device using the default timeout value, five seconds, it may fail because the router does not wait long enough for a response from the remote device. Therefore, you may want to increase the timeout value so the router will allow enough time for a response.

For information about the **ping** command in Site Manager, refer to *Managing Routers and BNX Platforms*. For information using the Technician Interface, refer to *Using Technician Interface Software*.

Chapter 4
Dial-on-Demand Implementation Notes

This chapter provides information about Bay Networks implementation of dial-on-demand.

Data Compression

Site Manager allows you to configure the Bay Networks proprietary compression protocol, WCP, over any PPP demand circuit.

Enabling compression improves bandwidth efficiency by eliminating redundant strings in data streams. This, in turn, improves network response times and yields line-cost savings.

To implement data compression, you must be in the Demand Circuits configuration window. To display the list of available protocols, click on Protocols, which appears after creating a demand circuit, and select WCP from the Select Protocols menu (Chapter 8). Note that WCP does not work with any other router's compression protocol.

For further information about data compression, see *Configuring Data Compression Services.*

PPP Multilink

Multilink is a feature of PPP that you can enable for individual PPP links. Links are logical communication channels between two routers. Typical links include one ISDN B channel, one dial-up modem connection, and a leased T1 line. Multilink enables you to:

- Group lines of different speeds
- Distribute traffic more evenly among the lines
- Restore packet sequence
- Monitor traffic volume (in the context of bandwidth-on-demand)

These features are particularly beneficial for adding bandwidth to relieve a congested demand circuit. The router activates additional dial-up lines to relieve congestion over a demand line.

When you enable multilink, you can group a set of lines between two routers into a single *bundle*. Each bundle belongs to a separate circuit. Multilink distributes traffic over each logical line in a bundle in an amount roughly proportional to the effective bandwidth of the link. Once data reaches the destination router, multilink resequences packets arriving on different lines.

Broadcast Traffic across Demand Circuits

Many of the routing protocols that you can select for a demand circuit send update packets out to the network. Update packets maintain routing tables and gather information about network resources. For dial-on-demand, the frequency of these update packets forces the dial-up connection to remain permanent (unless you configure a time of day to deactivate it). When routers exchange update packets, the physical connection is established unless you create a filter.

To reduce this type of traffic, you can configure one of the following:

- Static routes
- RIP triggered updates and broadcast timers (for IP)
- RIP and SAP broadcast timers (for IPX)
- Traffic filters
- Dial optimized routing

Static Routes

You need to configure the demand-circuit protocols so that they do not send broadcast messages out to the network. Once you disable broadcast messages, the router must determine the destination address using another means: *static routes*.

A *static route* specifies the transmission path that data must follow to another network. This path is based on the destination address of the data. Protocols that can use static routes include

- AURP
- DECnet
- DLSw
- IP
- IPX
- XNS

Demand circuits require static routes if you disable the circuit's routing update protocols. To configure a static route, you need to specify in the protocol's routing table the address of the network to which you will be sending data. The address must be unique to that circuit. For more information about static routes for each of these protocols, refer to the appropriate protocol manual.

IP RIP Triggered Updates and Broadcast Timers

To prevent broadcast messages from keeping the demand circuit up, you can configure the Routing Information Protocol (RIP) broadcast timer together with triggered updates.

The broadcast timer lets you configure how often the router sends routing updates to the network. Using this timer, you can control the frequency of broadcast transmissions. Unlike the broadcast timer, triggered updates are those sent immediately after the router detects any routing change in the network.

If you set the broadcast timer to a large value, for example, several hours, and you enable triggered updates, you limit the frequency of broadcast transmissions while maintaining the accuracy of the routing tables. By limiting broadcast traffic, the demand circuit does not remain active unnecessarily.

For more information about these RIP features, refer to *Configuring IP Services.*

IPX RIP and SAP Broadcast Timers

To prevent broadcast messages from keeping the demand circuit up, you can configure Routing Information Protocol (RIP) and Service Advertising Protocol (SAP) broadcast timers for IPX transmission.

RIP and SAP broadcast timers enable you to control the frequency of update packet transmissions. These broadcast timers allow you to configure how often update transmissions occur. You can even eliminate RIP and SAP broadcasts entirely. By controlling broadcast traffic, you can prevent the demand circuit from remaining active unnecessarily.

For information about broadcast timers, refer to *Configuring IPX Services*.

Traffic Filters

To prevent routing updates and protocol-specific messages from keeping the circuit up, you can configure traffic filters that specify which packets are permitted across an established dial-up line and which packets are prevented from bringing up a dial-up line.

Traffic filters enable the router to selectively relay or drop a packet, frame, or datagram, based on standard protocol fields or user-defined fields.

If you implement inbound filters, the router drops unwanted packets at the interface where the router receives data. By filtering incoming data, you can prevent the unwanted packets from passing on to the destination interface.

If you implement outbound filters, the router drops unwanted packets before dialing a line. The router continues to filter the data so the unwanted packets do not keep the circuit up.

You can also filter outbound packets to prevent the inactivity timer from resetting. For example, RIP packets can always be sent out, but if no other data is sent, the inactivity time expires and the line goes down.

To configure traffic filters, see *Configuring Traffic Filters and Protocol Prioritization.*

Dial Optimized Routing

Dial optimized routing lets you exchange IP RIP and IPX RIP/SAP routing updates only when a connection is active for data transmission. By limiting when the router can send updates, dial optimized routing reduces unnecessary connections and line costs.

For each dial-on-demand circuit, you have the choice of enabling dial optimized routing. If you enable dial optimized routing, the router establishes a demand connection only for outbound data packets or through requests from the protocol. The presence of IP RIP and IPX RIP/SAP packets alone will not trigger a dial connection. If you disable dial optimized routing, any packets can initiate demand connections.

Version 11.0 supports dial optimized routing only for IP and IPX. For all other protocols, the router activates a demand connection for any type of routing packet, regardless of dial optimized routing. To avoid this problem, you can configure traffic filters that prevent specific types of packets from activating a connection. Refer to *Configuring Traffic Filters and Protocol Prioritization* for information about configuring filters.

What Happens When You Enable Dial Optimized Routing

When there is data to send, the router activates a demand connection. The router software then alerts the IP and IPX protocols that a connection is active and they can broadcast routing updates. The protocols can also send triggered updates, if any occur while the connection is up.

The connection remains active for a user-defined Minimum Duration Time. As the name indicates, this timer specifies the minimum amount of time the connection is active. This timer must be set long enough to send complete routing updates to the remote routers. The inactivity timer, which starts at the same time as the minimum duration timer, determines how long the connection remains active by monitoring data inactivity. When there is no more data going across the line, the inactivity time expires and the router brings down the connection.

Exceptions for Sending Routing Updates

Routing updates are sent independent of data in the following two cases:

- An IP or IPX interface becomes active for the first time.

  When an IP or IPX interface first initializes, the protocol sends routing updates to every node in the network. If there is no data, the connection expires in the user-configured Minimum Duration Time.

- The RIP Broadcast Timer (IP) or RIP/SAP Update Interval (IPX) expires.

  Each time the Broadcast Timer or Update Interval expires, the protocol can request to send updates over an active connection. If you enable dial optimized routing, the value of the timer defaults to a large value so connections are infrequent. Setting the value of the Broadcast Timer or Update Interval to a small value would defeat the purpose of dial optimized routing.

  If a connection is made because there is data to send, the router uses this opportunity to send routing updates. Consequently, these timers reset instead of expiring. This further reduces the frequency of connections made due to a request by the protocol.

Maintaining the Routing Table

Although dial optimized routing limits the amount of routing information across the network, you can maintain the accuracy of the routing tables using the following methods.

- Set the Hold Down Timer to a higher value than the Broadcast Timer or Update Interval.

  The Holddown Timer specifies how long unusable routes are advertised after the route is invalid. This ensures that unreachable routes are kept in the routing table long enough to be broadcast over an active connection.

- Synchronize protocol requests for a connection.

  When a connection is active, the router software sends status messages to IP or IPX, alerting the protocol that it may send routing updates. If the protocol does not receive this connection message, it will make a separate request for a connection. This request causes the Minimum Duration Time to reset and the connection then remains active for the specified minimum time.

- Configure the router to handle oversubscription of lines.

  If you do not have enough lines to accommodate the number of circuits, you can enable an oversubscription timer. This timer determines the frequency that the router retries a connection for routing updates if the previous attempt failed. The router keeps a list of circuits requesting connections and tries to establish these connections when the timer expires.

  To configure the oversubscription timer, you must use the Technician Interface. This attribute is not available through Site Manager. The attribute entry is wfSwservOptsEntry.wfSwservOptsOverSubRetryTimer. The default setting is two minutes; the maximum value is 1440 minutes.

Refer to *Configuring IP Services* for information about RIP and *Configuring IPX Services* for information on RIP/SAP.

Protocol Prioritization

When you configure a router, you can prioritize the different types of traffic sent across a synchronous line. This process is called *protocol prioritization*. Being able to prioritize traffic is important for your time-sensitive applications.

For example, a user at Router A participating in a Telnet session with Router B requires a more immediate response than does a user at Router A performing a file transfer with Router B.

When you configure a demand circuit, the router automatically enables protocol prioritization because PPP requires priority for control messages.

Although protocol prioritization is set automatically, you still need to configure priorities and filters. For more information about protocol prioritization see *Configuring Traffic Filters and Protocol Prioritization*.

Note: Do not configure protocol prioritization for circuits running PPP multilink, for example, bandwidth-on-demand circuits supporting a congested demand circuit.

Chapter 5
Dial Backup Implementation Notes

This chapter provides information about Bay Networks implementation of dial backup service. Most of these notes are only for circuit backup; that is, they apply only to a Standard, PPP, or a single Frame Relay PVC primary. Data compression is the only feature that you can use with circuit and link backup.

Data Compression

Site Manager allows you to configure the Bay Networks proprietary compression protocol, WCP, over any PPP or Frame Relay primary and backup circuit.

Enabling compression improves bandwidth efficiency by eliminating redundant strings in data streams. This, in turn, improves network response times and yields line-cost savings.

To implement data compression, you must enable the WCP protocol on the leased circuit that you initially select before you configure backup pools (see *Configuring Routers* for instructions).

For further information about data compression, see *Configuring Data Compression Services.*

Defining the Role of the Router in the Network

When you configure a router for dial backup, you must specify whether the router initiates calls or waits to receive calls. The router placing the backup call waits until the primary circuit fails. The other router waits for the call without trying to initiate it. If you do not specify the role of each router, each one tries to call the other simultaneously, and the routers receive busy signals.

You define the role of the router via the Backup Mode parameter, which is part of the primary circuit configuration (see Chapter 9). Do not configure both sides of the circuit with the same value.

Bandwidth for Backup Circuits

Time-sensitive protocols or interactive protocols (for example, Telnet) may not function correctly over a backup circuit that has less bandwidth than the primary circuit. When user-response time is critical, backup circuits require equal bandwidth as the primary circuits.

Using Unnumbered Interfaces to Dial an Alternate Site

IP unnumbered interfaces are interfaces on a point-to-point connection for which you do not configure a specific IP address, for example, 128.185.35.70. Instead, you configure an address of 0.0.0.0. Unnumbered interfaces are useful because the router is no longer restricted to a specific IP destination address. This gives the router the flexibility to dial an alternate site if it cannot reach the original destination.

If you configure unnumbered IP over a PPP primary circuit and the connection to the destination router fails, the local router automatically dials each phone number in the outgoing phone list until it successfully connects to an alternate router.

You can also configure unnumbered interfaces for IPX and bridge protocols; however, the sample application that follows describes only IP to simplify the example. For more information about unnumbered interfaces, refer to *Configuring IP Services*; *Configuring IPX Services*; or *Configuring Bridging Services.*

Sample Network Using Unnumbered Interfaces

Figure 5-1 shows an example using IP unnumbered interfaces and dial backup. Router A, the remote router, connects to Router B, the regional router, via a primary leased line. Router B connects to Router C, the central router, via a normal leased line, that is, a leased line without dial backup service.

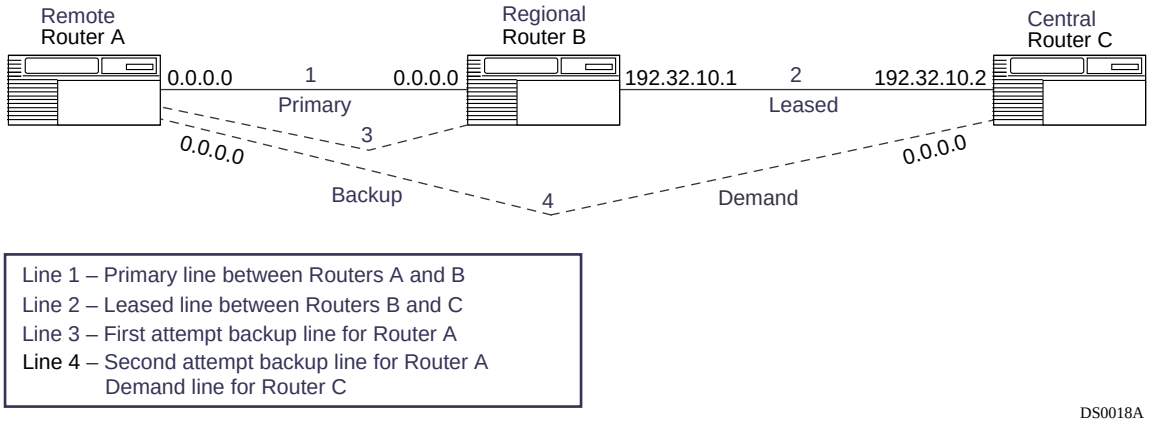


Figure 5-1. Dialing an Alternate Router Using IP Unnumbered Interfaces

If the primary connection between Routers A and B goes down, the backup circuit takes over, adopting the configuration of the primary circuit. The backup circuit tries to call Router B, but it finds it cannot establish a connection.

Because you configure unnumbered IP addresses on the primary circuit, Router A is not limited to calling Router B. Router A dials the next phone number in its outgoing phone list, which is Router C's phone number, and makes a connection.

For Router A to dial Router C, you must configure the routers according to the requirements in Table 5-1.

Table 5-1. Configuration for Routers A and C

Router A	Router C
Configure an unnumbered PPP primary circuit.	Configure a demand pool with unnumbered demand circuits.
Configure routing protocols for the primary circuit.	Configure routing protocols on the demand circuit to match Router A's routing protocol configuration for the primary circuit.
N/A	Set Connection Mode parameter to **No Dial**.
Include CHAP Name/Secret or PAP ID/Password for the primary circuit.	Configure the Caller Resolution Table to include Router A's CHAP Name/Secret or PAP ID/Password.

Simplifying Unnumbered Configurations Using Demand Circuit Groups

To set up a large network that includes a recovery router to back up a regional router supporting many remote sites, you can simplify configuration by using unnumbered interfaces as part of a *demand circuit group*.

A demand circuit group is a set of demand circuits that share the same user-defined, unnumbered protocol configuration. An unnumbered protocol configuration does not restrict the router to a specific destination address. Instead, it enables the router to use any circuit in the group for an incoming call, eliminating the need to configure a unique demand circuit for each remote node in the network. One demand circuit group supports many remote routers, thereby reducing the configuration tasks for a large network.

Demand Pools and Demand Circuit Groups

Like individual demand circuits, a demand circuit group is associated with an existing demand pool. The number of circuits in the demand circuit group must be less than or equal to the number of lines in the demand pool. If you change the number of lines in a demand pool, you must increase or decrease the number of demand circuits in the group accordingly.

When the router activates a line in the demand pool, the circuits in a demand circuit group also become available. The router does not actually bring up the circuits until it receives an incoming call. Demand circuit groups can only receive calls.

A circuit group can belong to more than one demand pool. This enables the router to use one configuration for circuits across the router's slots. Note however, that demand pools cannot cross slots.

Each demand circuit group has its own ID. This number is distinct from the demand pool ID that identifies the line pool.

Note that both individual demand circuits and demand circuit groups can use the same demand pool.

Caller Resolution for Demand Circuit Groups

Similar to individual demand circuits, demand circuit groups use either PAP or CHAP to identify who is calling the router and to determine which circuit group to activate. You can enable either of these authentication protocols on only one side of the link (*one-way authentication)*, or on both sides of the link (*two-way authentication*). For information about authentication, refer to Chapter 3.

Depending on a network's security requirements, each remote node can have a unique CHAP Name or PAP ID, or the remote nodes can use the same name. For each remote caller with a unique PAP ID or CHAP Name, the caller resolution table contains a demand circuit group ID. The remote callers may use the same demand circuit group ID. When it authenticates an incoming call, the recovery router receives the ID or name, and then looks up the corresponding circuit group ID in the table. From this circuit group, the router selects an available circuit and establishes the unnumbered protocol configuration over that circuit.

To simplify configuration, the caller resolution table may contain the same PAP ID or CHAP name for all remote nodes in the network. Then the table has only one entry consisting of the name and the demand circuit group ID.

A router configured with demand circuit groups does not initiate connections for the group; the remote side of the connection must place the call first. Consequently, you do not need to configure the *local* PAP ID and password or CHAP name and secret for a call request.

Note: The caller resolution table may not contain both individual demand circuit numbers and demand circuit group IDs for the same caller name.

If, for added network security, each remote node has a unique PAP ID or CHAP name and the same circuit group ID, the router verifies the caller's name in the incoming call setup message. If it does not match a name in the table, the router disconnects the call.

Protocol Configuration for Demand Circuit Groups

You must configure a demand circuit group with one of the following unnumbered protocols:

- IP with either RIP, RIP II, or OSPF as the routing protocol
- IPX with RIP, SAP, and/or NLSP as the routing protocol
- Bridging

Note: When you configure a protocol for a demand circuit group, Site Manager requires that you also configure a routing protocol.

The protocol configuration applies to all circuits in the group and applies to a list of remote nodes that can call the recovery router.

Without the use of specific network addresses, the recovery router must use routing updates to determine the data path to the remote nodes. Unlike individual demand circuits, you can enable routing protocols for a demand circuit group without the update protocol establishing a switched connection unnecessarily. The demand circuit group and its protocol interface are active only when the physical connection is active. Without a physical line available, no circuit or protocol information, for example, RIP update packets, pass from one router to the next.

Sample Application Using Demand Circuit Groups

Figure 5-2 shows one of the main applications for using unnumbered demand circuit groups. Router 1 is a regional router that supports potentially hundreds of remote nodes. Router 5 serves as a recovery router for several branch offices if the regional router (Router 1) fails.

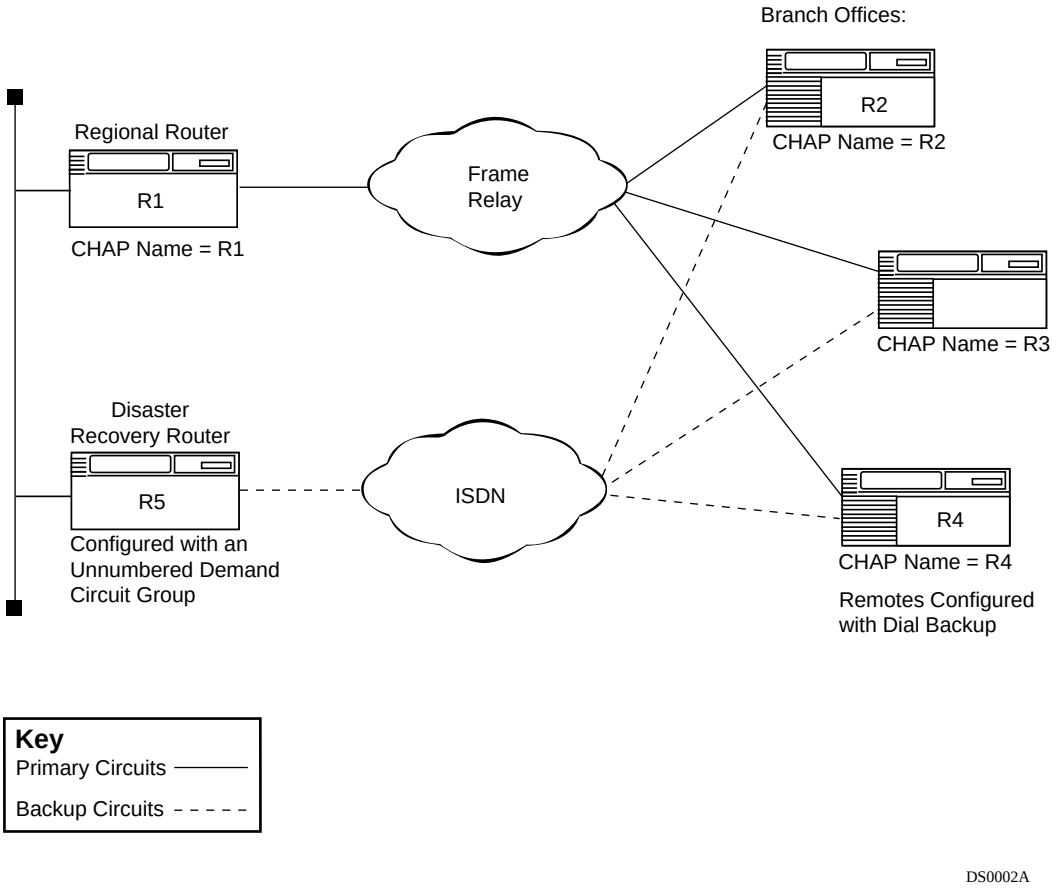


Figure 5-2. Dialing an Alternate Site Using Demand Circuit Groups

This type of network is ideal for an unnumbered demand circuit group because it supports an extensive number of nodes. If you were to configure each circuit individually, the task of backing up each remote router would be difficult. By using demand circuit groups, however, you need only one configuration on the disaster recovery router to support many remote sites.

The configuration for this type of network is as follows:

- The branch offices are configured for dial backup and are connected directly to the regional router. They determine if the connection to the regional router fails and invoke the dial backup connection.
- The circuits on Router 5, the recovery router, are configured as a demand circuit group, with three circuits in the group. (Router 5 uses an existing demand pool for the demand circuit group.) These circuits accept calls from the remote routers configured with dial backup.

  The Connection Mode for the circuits in the demand circuit group is set to **No Dial** because the recovery router does not initiate connections. The remote side of the connection must establish the connection first.
- Router 5's Caller Resolution Table contains entries for Routers 2, 3, and 4. Each entry specifies the same demand circuit group.

In the example, if any of the branch offices detect a failure of the regional router's primary line, they attempt to bring up a dial backup connection by placing a call to the recovery router. The number of branch offices that successfully connect to the recovery router depends on the number of circuits in the demand circuit group. Once the connection is made, data can continue across the network.

Note: Demand circuit groups only work with PPP. You cannot use them in a network where the dial backup circuits are using Frame Relay.

Chapter 6
Bandwidth-on-Demand Implementation Notes

This chapter provides information about Bay Networks implementation of bandwidth-on-demand service.

PPP Multilink

Multilink is a feature of PPP that you can enable for individual PPP links. Links are logical communication channels between two routers. Typical links include two ISDN B channels, one dial-up modem connection, and a leased 64 Kb/s line. Multilink enables you to:

- Group lines of different speeds
- Distribute traffic more evenly among the lines
- Maintain packet sequence
- Monitor traffic volume (in the context of bandwidth-on-demand)

These features are particularly beneficial for bandwidth-on-demand configurations, where the router activates additional dial-up lines to relieve congestion over a single leased line, a leased multilink bundle, or a dial-on-demand line. Site Manager automatically configures PPP multilink when you configure circuits for bandwidth-on-demand service.

Multilink lets you group a set of lines between two routers into a single *bundle*, which can consist of up to 30 links of different speeds. The actual number of links in the bundle depends on hardware platform, total bundle speed, the speed of each link in the bundle, and type of traffic.

Each bundle belongs to a separate circuit. Multilink distributes traffic over each logical line in a bundle in an amount roughly proportional to the effective bandwidth of the link.

The router sending information divides the outbound traffic among all the lines in the bundle. Once data reaches the destination router, multilink reassembles and resequences packets arriving on different lines.

Figure 6-1 shows how multilink and bandwidth-on-demand work together. In this figure, you configure one router as the congestion monitor. This router monitors traffic volume over the bandwidth circuit. If the monitor router detects congestion, it brings up an additional line, in this case, an ISDN B channel. If traffic is still heavy, the monitor router adds more channels until congestion is relieved.

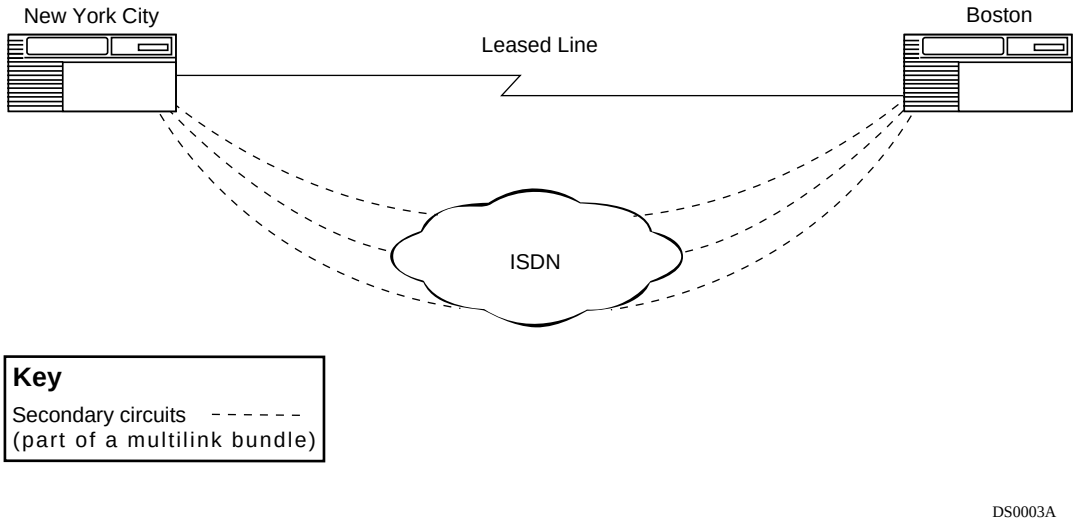


Figure 6-1. Multilink and Bandwidth-on-Demand Operation

For more information about PPP multilink, see *Configuring PPP Services.*

Multilink Fragmentation

Multilink fragmentation splits datagrams into smaller packets when necessary and sends these packets across links in a multilink bundle. Fragmentation improves the distribution of data across multilink lines and uses buffer resources more efficiently, thereby improving communication over bandwidth circuits. Bay Networks routers comply with RFC 1717, which defines PPP multilink.

Packets sent over a multilink bundle have an outer header packet that contains a unique packet sequence number and allows for the following:

- Fragmentation of the original packets
- Assignment of sequence numbers to each fragment
- Transmission over a number of links in the bundle
- Reassembly of the original sequence and packet size at the destination router

For more information about multilink and fragmentation, refer to *Configuring PPP Services*.

Protocol Prioritization

When you configure a router, you can prioritize the different types of traffic sent across a line. This process is called *protocol prioritization.* When you configure leased bandwidth circuits, the router automatically enables protocol prioritization.

PPP multilink uses the automatically enabled functions of protocol prioritization, but only for interrupt queueing. You cannot specify either filters or priorities. Multilink assigns the highest (that is, interrupt-level) priority to link control packets, treating all other traffic as normal priority. This gives PPP control messages precedence over other types of data while preserving the packet sequencing.

For more information about protocol prioritization see *Configuring Traffic Filters and Protocol Prioritization.*

Defining the Role of the Router in the Network

Leased bandwidth circuits are point-to-point connections. For each circuit, you must designate a router at one end of the connection as the *congestion monitor.*

The congestion monitor checks the congestion of the lines in a multilink bundle. If this router discovers congestion, it activates secondary lines. The router at the other end of the connection, the *nonmonitor router,* does not have the authority to activate a secondary line. It is important to define the role of each router on the link to avoid both routers bringing up a second line simultaneously.

You define the role of the router via the Bandwidth Mode parameter, which is part of the bandwidth circuit configuration (see Chapter 8). Do not configure both sides of the circuit as the congestion monitor.

Balancing Traffic between Lines in a Multilink Bundle

With multilink enabled for bandwidth-on-demand, the router sending data divides the outbound traffic among all the lines in the bundle. The configured external clock speed of each line determines the proportion of the total traffic each receives. On the receiving end, multilink resequences packets arriving on different links using the sequence number from the multilink header.

For more information about traffic distribution, see *Configuring PPP Services.*

Ensuring Accuracy of the Congestion Thresholds

The router uses several congestion threshold parameters to measure congestion on the bandwidth circuit. The value of these parameters determines when the router activates additional lines to relieve congestion.

If you want to configure the clock speed of your leased line to any value other than the default, 64 Kb/s, this affects how the router calculates the congestion thresholds. To ensure the router’s calculations are accurate, you must modify the clock speed via the synchronous line parameter External Clock Speed. Once you configure this parameter to the actual speed of the line, you ensure that the congestion thresholds will be correct.

The External Clock Speed parameter is part of the Synchronous Line Details configuration. To access synchronous line parameters, begin at the Configuration Manager window and select the Circuits > Edit Lines option. From here, you can select the circuit that you want to edit.

For further instructions on accessing and modifying the synchronous line parameters, refer to *Configuring Line Services*.

Testing the Bandwidth-on-Demand Connection

To ensure that the router can activate one secondary line if the leased connection becomes congested, you can execute a **forced dial** command. The **forced dial** command indicates to the router that the leased line or bundle is congested even if this is not the case. The router then brings up a secondary line. If a secondary line does not come up, there is a problem with the secondary connection.

A **forced dial** and **forced take down** only occur when their values change from 2 to 1. To issue the **forced dial** command, use the Technician Interface and change the value to 1. The command syntax is

set wfSwservOptsEntry.wfSwservOptsForcedDial.<*circuit_no***.> 1;commit**

To terminate a forced dial connection, you must issue a **forced take down** command. To execute a **forced take down** enter the following:

set wfSwservOptsEntry.wfSwservOptsForcedTakedown.<*circuit_no***.> 1;commit**

Note: You cannot use this method to test congested demand circuits configured with bandwidth-on-demand service.

Chapter 7
Creating Line Pools

This chapter provides instructions on how to create demand, backup, and bandwidth-on-demand line pools. The configuration procedures for creating line pools are similar for all three dial services. To avoid repetition, this chapter shows only the dial-on-demand configuration windows as examples. For dial backup or bandwidth-on-demand pools, the window may have a different title, but the procedure is the same.

This chapter assumes you have read *Configuring Routers* and that you have

1. Opened a configuration file
2. Specified router hardware if this is a local mode configuration file
3. Configured ports on the router that you want as a leased connections (dial backup or bandwidth-on-demand only).

   For dial backup and bandwidth-on-demand, select any COM or MCT1/E1 port on a link or net module and configure a leased interface before going to the Dialup option on the Configuration Manager main menu (Figure 7-1). Refer to *Configuring Routers* for instructions. Later, you designate these interfaces as dial backup primary or bandwidth-on-demand circuits.

   For dial-on-demand, you go directly to the Dialup option without selecting a port.

To configure a line pool you

1. Define pool IDs.
2. Select one or more lines to include in each pool.
3. Configure the signaling method or service for each line (Raise DTR, V.25bis, or ISDN).

Using the MIB Object ID

For each parameter, this chapter includes default settings, valid parameter options, the parameter function, instructions for setting the parameter, and the Management Information Base (MIB) Object ID.

The Technician Interface allows you to modify parameters by issuing **set** and **commit** commands with the MIB object ID. This process is equivalent to modifying parameters using Site Manager. For more information about using the Technician Interface to access the MIB, refer to *Using Technician Interface Software*.

Caution: The Technician Interface does not verify that the value you enter for a parameter is valid. Entering an invalid value can corrupt your configuration.

Configuring Line Pools

The procedures for creating demand, backup, and bandwidth-on-demand line pools are the same. However, when you add lines to each pool, the procedures for configuring Raise DTR and V.25bis are different from those for ISDN.

Before you begin, be aware of the following:

- When adding lines to a pool, configure all lines in a pool to use the same authentication protocol. You cannot have a pool with one line using CHAP and another using PAP.
- Both individual circuits and demand circuit groups may use demand pools.

Creating Line Pools with Raise DTR and V.25bis Interfaces

To create pools with lines that use Raise DTR, or V.25bis signaling:

1. **Select Dialup > Demand Pools, Backup Pools, or Bandwidth-on-Demand Pools from the Configuration Manager window (Figure 7-1).**

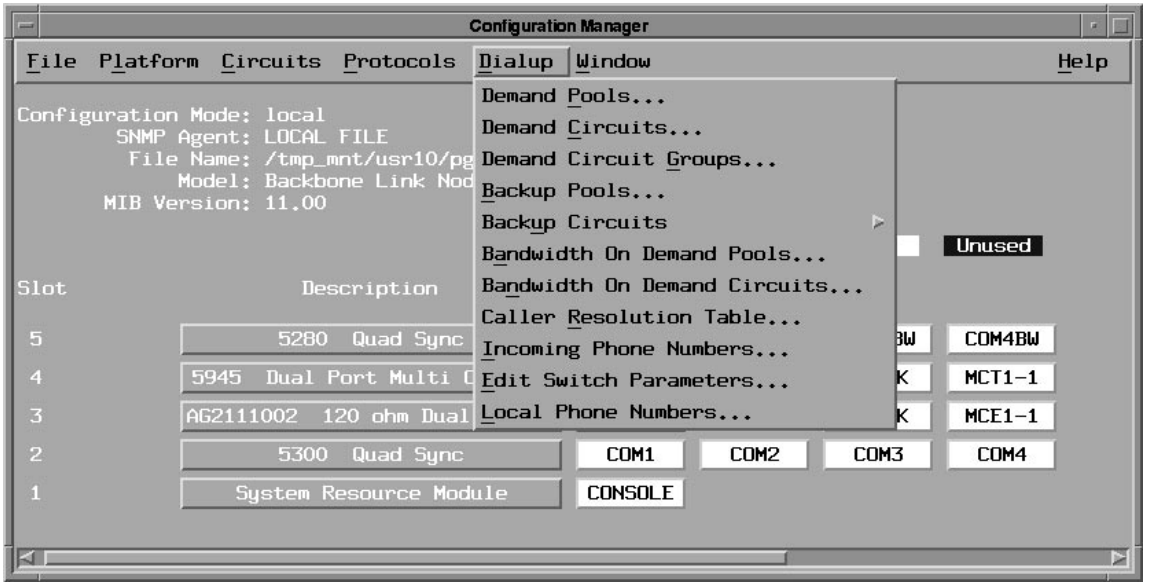


Figure 7-1. Configuration Manager Window

Site Manager displays a Pools window (Figure 7-2).

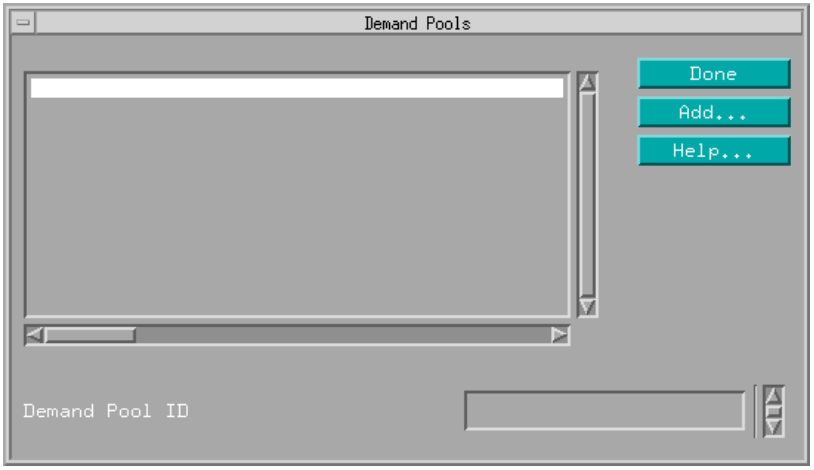


Figure 7-2. Demand Pools Window

2. **In the Pools window, click on Add.**

   Site Manager displays the Pool Configuration window (Figure 7-3).

Figure 7-3. Demand Pool Configuration Window

3. **In this window, enter a Pool ID, referring to the parameter description following these procedures, and click on OK.**

   You can use the same number for a demand, backup, or bandwidth pool. You cannot use the same number for two of the same type of pool.

Site Manager displays the Lines Definition window (Figure 7-4).

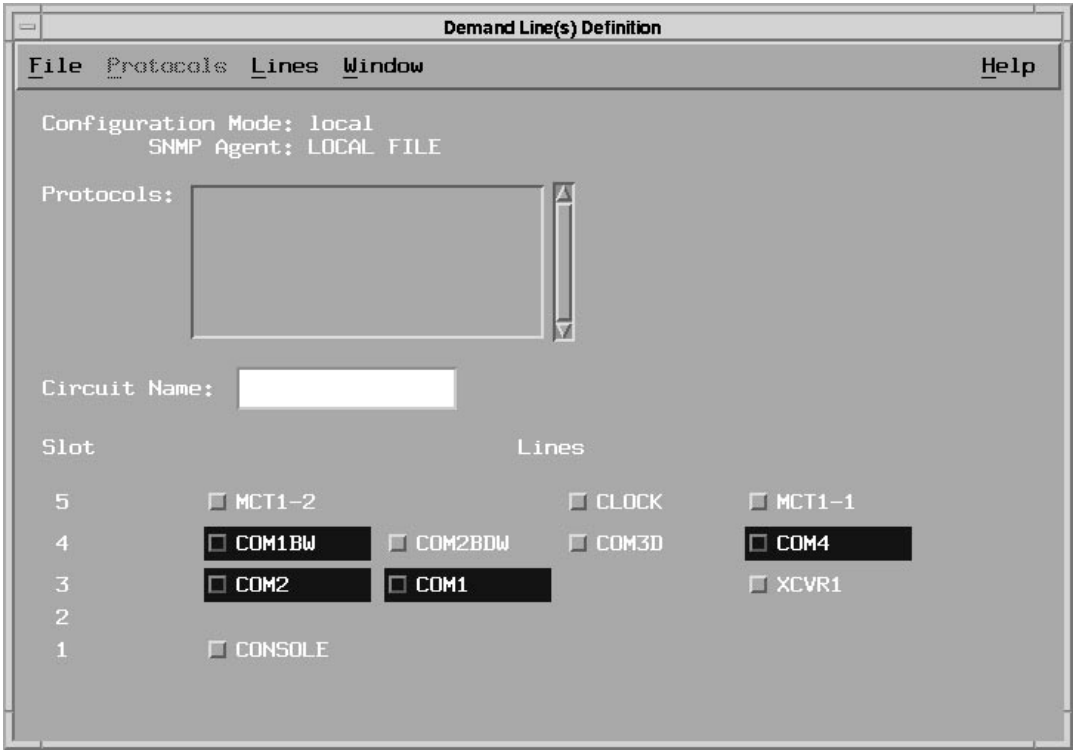


Figure 7-4. Demand Lines Definition Window for a BLN

4. **Click on one of the available COM ports to assign a line to the pool, but follow these guidelines:**

   - Site Manager does not allow you to select any lines for a pool that you previously configured as leased lines. These are COM lines that you initially configured when you set up an interface.
   - The lines that you select for a demand pool must reside in the same slot.
   - The lines that you select for a backup and bandwidth-on-demand pool can reside across slots.
   - Lines in any pool can be a combination of Raise DTR, V.25bis, and ISDN.

Once you select a port, Site Manager displays the WAN Serial Interface Type window (Figure 7-5).

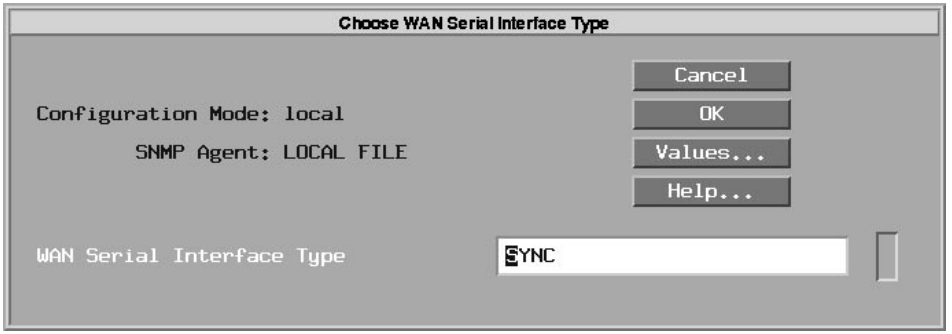


Figure 7-5. WAN Serial Interface Type Window

Note: On the BLN and BCN, Site Manager displays the WAN Serial Interface Type window only for ports on an Octal Sync Link Module. For all other modules, Site Manager goes directly to the Line Media Type window.

5. **Configure the WAN interface according the parameter description that follows this procedure.**

   If you accept the default, **Sync**, Site Manager displays the Sync Line Media Type window (Figure 7-6).

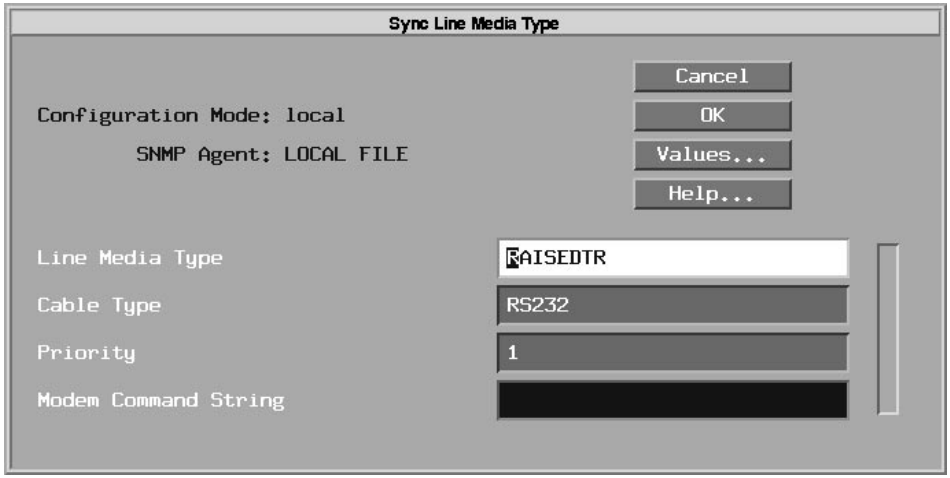


Figure 7-6. Sync Line Media Type Window

If you select **Async**, Site Manager displays the Async Line Media Type window (Figure 7-7).

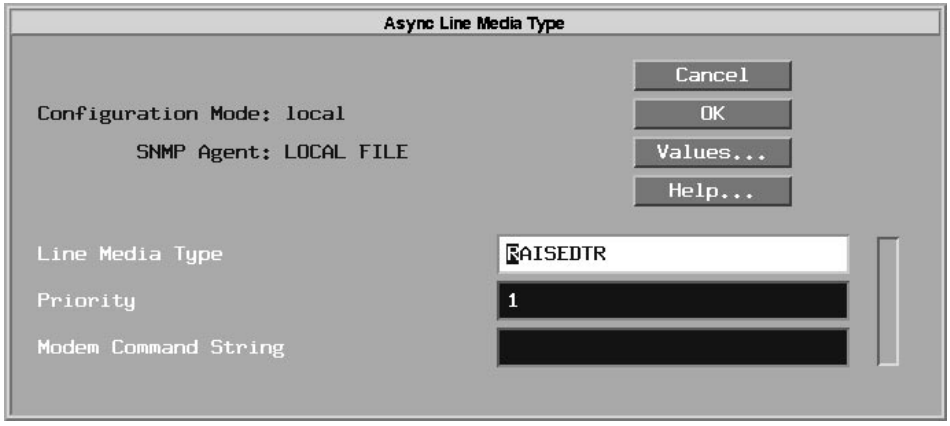


Figure 7-7. Async Line Media Type Window

6. **For either line media type window, click on OK to accept the defaults or modify the parameter values, referring to the parameter descriptions on page 7-10.**

7. **Click on OK to save your changes.**

   Site Manager redisplays the Lines Definition window (Figure 7-8).

   The letter D (demand), B (backup), or W (bandwidth-on-demand) appears next to the COM port to indicate the type of line it is. You will not see this designation next to MCT1 or MCE1 ports. Note that the router can use the same line for all three types of pools. In addition, any asynchronous ports will have an @ (at sign) to indicate that it is an async port.

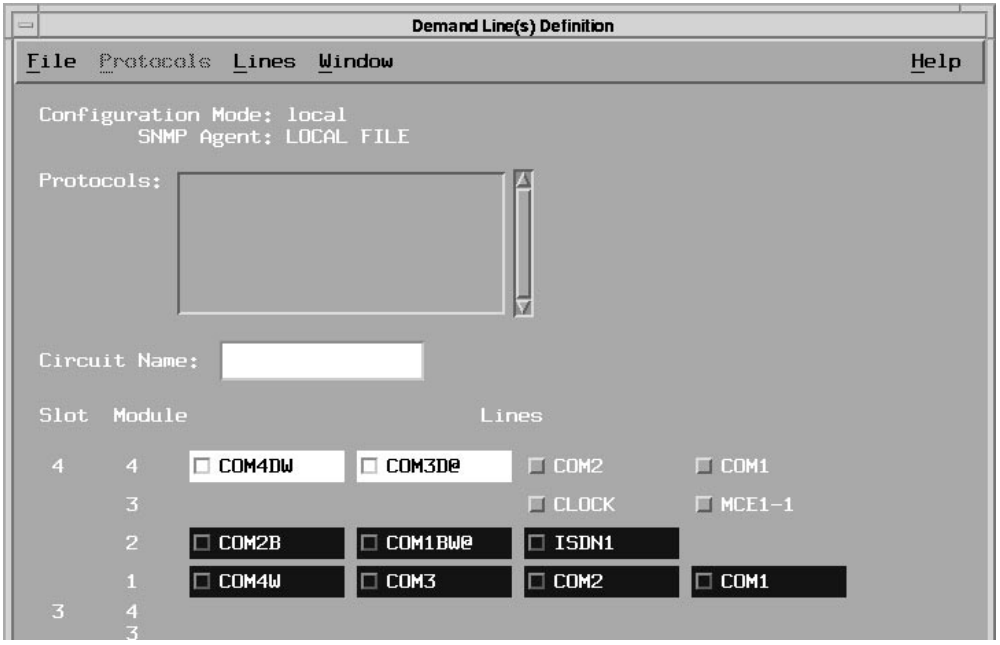


Figure 7-8. Lines Marked as Demand, Backup, or Bandwidth

Before you exit from the Lines Definition window, you can add more lines to a pool. To do this:

1. **Select and configure any additional lines from the Lines Definition window.**
2. **Select File > Exit to exit from the Lines Definition window.**

Site Manager redisplays the Pools window with three new buttons (Edit, Apply, and Delete) that allow you to edit the newly created pool (Figure 7-9).

Note: These three new buttons on the Pools window appear only if a line pool already exists.

Pool ID Parameter

Use the following description when you configure the Pool ID parameter.

Parameter:	**Demand/Backup/Bandwidth-on-Demand Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the line pool by assigning it a number.
Instructions:	Enter a number between 1 and 255, inclusive, as the line pool ID.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.6 (Demand Pool ID) 1.3.6.1.4.1.18.3.5.1.4.5.1.5 (Backup Pool ID) 1.3.6.1.4.1.18.3.5.1.4.5.1.35 (Bandwidth Pool ID)

WAN Serial Interface Type Parameter

Use the following description as a guideline when you configure the WAN Serial Interface Type parameter.

Parameter:	**WAN Serial Interface Type**
Default:	Sync
Options:	Sync | Async
Function:	Determines whether this interface uses synchronous communication or asynchronous communication.
Instructions:	If you are using asynchronous PPP, select Async. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.4.5.1.109

Sync and Async Line Media Type Parameters

Use the following descriptions as guidelines when you configure line media type parameters.

Parameter:	**Line Media Type**
Default:	Raise DTR
Options:	Raise DTR | V25bis
Function:	Specifies the signaling method that the router uses for this line.
Instructions:	Accept the default, Raise DTR, or select V25bis, depending on the signaling method supported by the attached dial device.
MIB Object ID:	1.3.6.1.4.1.18.3.4.5.1.54

Parameter:	**Cable Type (sync only)**
Default:	RS232
Options:	NULL | RS232 | RS422 | V35 | X21
Function:	Indicates the physical interface type supported by the attached dial unit.
Instructions:	Select the option that corresponds to the interface type supported by the attached dial unit.
MIB Object ID:	1.3.6.1.4.1.18.3.4.5.1.83

Parameter:	**Priority**
Default:	1
Range:	1 to 50
Function:	Prioritizes a group of lines in the same pool. For example, the router uses a line of priority 1 before it uses a line of priority 2. For dial backup and bandwidth-on-demand pools, lines can reside across slots, but when you set this parameter, it affects only lines on the same slot. In the case of dial backup, if you have two lines in Slot 3 and three lines in Slot 4, the router sets a priority between the lines in Slot 3, then sets a priority between the lines in Slot 4. For bandwidth-on-demand, the router prioritizes lines in the preferred slot, then the reserved, and finally the local slot.
Instructions:	Assign a number to each line in the pool. The lower the number, the higher the priority. For pools that combine Raise DTR/V.25bis lines with ISDN lines, coordinate the priority assignments for this interface with those you set via the Pool Channel Priority parameter for the ISDN interface.
MIB Object ID:	1.3.6.1.4.1.18.3.4.5.1.97

Parameter:	**Modem Command String**
Default:	None
Options:	Any valid modem command string.
Function:	Enables you to test and modify the configuration of your modem. For example, if you want to change the speed of your modem, you can enter a command string to do this. Also, if you are having trouble placing calls, enter a string to test whether the modem responds.
Instructions:	Enter a command string that your modem supports.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.13.1.4

Adding Line Pools

To create additional line pools:

1. **Repeat the procedures beginning on page 7-4, "Creating Line Pools with Raise DTR and V.25bis Interfaces."**
2. **Click on Done in the Pools window (Figure 7-9) when you finish adding pools.**

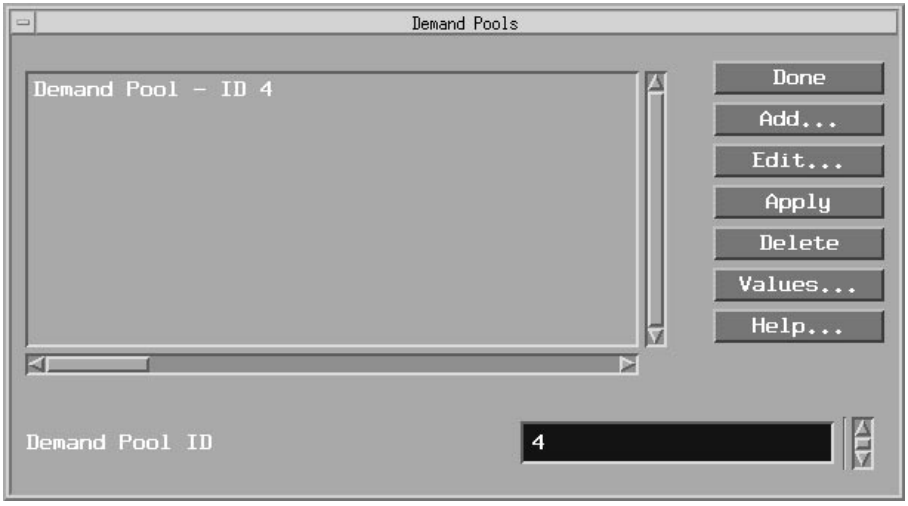


Figure 7-9. Demand Pools Window Listing Configured Pools

Editing Modem Parameters for V.25bis Lines

After you configure a line for V.25bis, you can configure the modem parameters for that line.

To edit the modem parameters:

1. **Begin at the Configuration Manager window and click on the line you want. Select a port labeled with a D, B, or W next to the port name.**

   Site Manager displays the Edit Connector window (Figure 7-10).

Figure 7-10. Edit Connector Window

2. **Click on Edit Modem to display the Modem Interface window (Figure 7-11).**

Note: Figure 7-11 is for asynchronous modems. The window for synchronous modems looks the same.

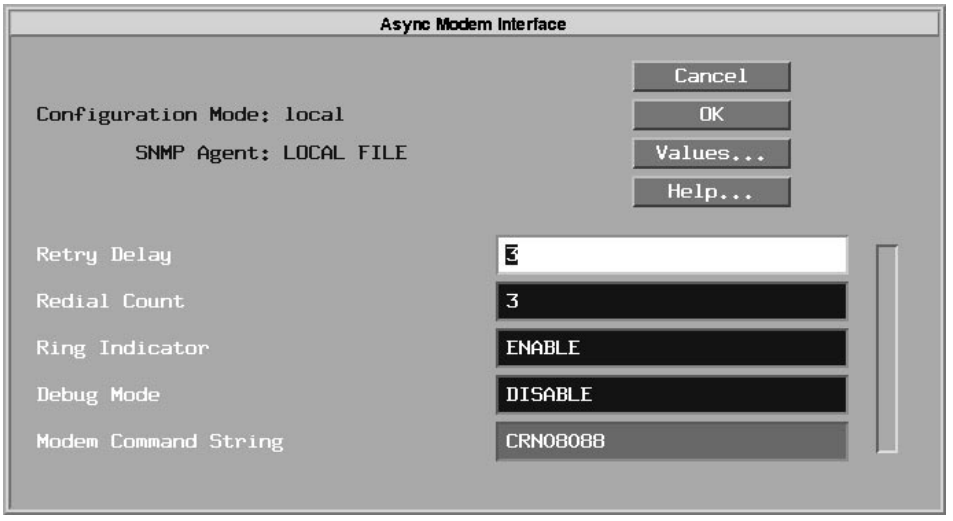


Figure 7-11. Async Modem Interface Window

3. **Enter new values for the modem interface parameters.**
4. **Click on OK when you finish editing the parameters. The Edit Connector window reappears (Figure 7-10).**
5. **Click on Done to exit.**

Modem Interface Parameter Descriptions

Use the following descriptions as guidelines when you configure the modem parameters.

Parameter:	**Retry Delay**
Default:	3 seconds
Range:	0 to infinity
Function:	Specifies the number of seconds the router waits between attempts to re-establish the connection.
Instructions:	Enter the number of seconds you want the router to wait between retry attempts.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.1.1.10

Parameter:	**Redial Count**
Default:	3
Range:	1 to 10 attempts
Function:	Specifies the maximum number of times that the router can attempt to connect to a dial-up line before it is disconnected.
Instructions:	Select a number between 1 and 10, inclusive.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.1.1.16

Parameter:	**Ring Indicator**
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables Ring Indicator (RI).
Instructions:	If the dial-on-demand line is configured to use Raise DTR, and you have a Series 5 router running 7.60 software, set this parameter to Disable. Hardware versions earlier than 7.60 do not support RI. Otherwise, leave the default, Enable.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.1.1.28

Parameter:	**Debug Mode**
Default:	Disable
Options:	Enable | Disable
Function:	Allows you to print debug log messages concerning the V.25bis or Raise DTR connection setup.
Instructions:	Select Enable if you want to see the debug log messages.If not, accept the default, Disable.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.1.1.29

Parameter:	**Modem Command String**
Default:	None
Options:	Any valid modem command string.
Function:	Enables you to test and modify the configuration of your modem. For example, if you want to change the speed of your modem, you can enter a command string to do this. Also, if you are having trouble placing calls, enter a string to test whether the modem responds.
Instructions:	Enter a command string that your modem supports.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.13.1.4

Configuring ISDN Lines

The procedure for configuring BRI at the physical layer is different from that of PRI, so instructions for configuring B channels are divided into two sections: BRI Interfaces and PRI Interfaces. Once you set the physical layer, you can create a line pool. At that point, the procedure for BRI and PRI is the same.

For the D channel, the default settings support most networks, so you do not have to edit the D channel parameters. If you would like to modify the D channel, go to "Modifying Line Pool Configurations" on page 7-55.

Note: You cannot modify the D channel, until you configure at least one B channel.

BRI Physical Interfaces

Before you begin, remember that BRI interfaces are only available on the AN and ASN hardware platforms.

To configure BRI lines:

1. **Begin at the Configuration Manager window (refer to Figure 7-1).**
2. **Click on an ISDN connector, and Site Manager displays the Port Application window (Figure 7-12).**

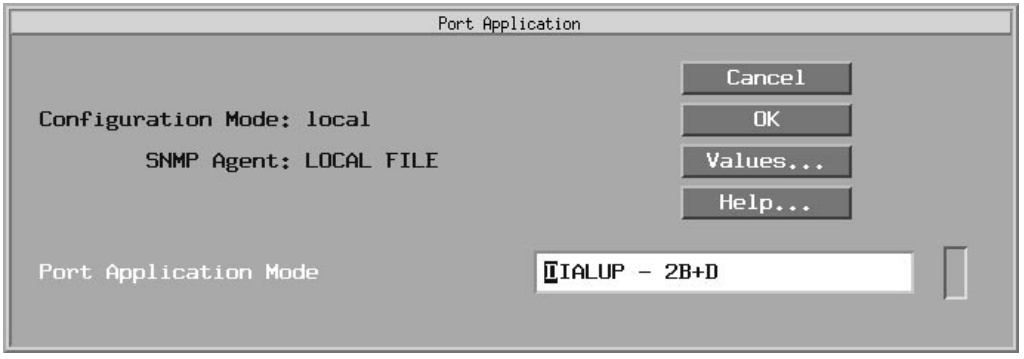


Figure 7-12. Port Application Window for BRI

3. **Select the Port Application mode for this line, referring to the parameter description that follows, and click on OK.**

   You return to the Configuration Manager window.

To continue, refer to "Creating Line Pools with ISDN Interfaces" on page 7-38.

BRI Port Application Parameter

Use the following description as a guideline when you configure the Port Application Mode.

Parameter:	**Port Application Mode**
Default:	Dialup – 2B+D
Options:	Dialup – 2B+D | Dialup – 1B + D | Dialup – Floating B (AN only) | Leased – 2X64K | Leased – 1X64K | Leased – 128K
Function:	Determines how the BRI interface operates. The options are Dialup – 2B+D: Specifies that this is an ISDN switched line that provides two B channels, and call setup is done between the router and an ISDN switch. Dialup – 1B + D: Specifies that this is an ISDN switched line that provides only one B channel, and call setup is done between the router and an ISDN switch. Use this option when you do not need to use two B channels. Dialup – Floating B: This option is available only on BayStack AN and ANH routers. It specifies that although this is an ISDN switched line that provides two B channels, the software makes the necessary adjustments if only one channel is in use. Use this option if you can only purchase 2B + D service, but only want to use one B channel, or your application requires two synchronous ports and only one B channel. Refer to Chapter 3 for more information.

Leased – 2X64K: Specifies that this line provides two B channels that are always available. No call setup is done with an ISDN switch. Instead, the switch has a defined point-to-point connection between two ISDN end points (only for Germany).

Leased – 1X64K: Specifies that this line provides one B channel that is always available. No call setup is done with an ISDN switch. Instead, the switch has a defined point-to-point connection between two ISDN end points (only for Germany).

Leased 128K: Specifies that this line provides one B channel that is always available. (The extra bandwidth of the 128 Kb/s channel is equivalent to having two B channels of 64 Kb/s.) No call setup is done with an ISDN switch. Instead, the switch has a defined point-to-point connection between two ISDN end points (only for Germany).

Instructions: If you have a dial-up application, choose one of the dial-up options. For networks in Germany, if you want to have the dial line up at all time and your ISDN switch can support permanent connections, select one of the leased options.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.8.9.1.34

PRI Physical Interfaces

Before you begin, remember that PRI interfaces are available only on the ASN, BCN and BLN hardware platforms using the following link modules:

- Single or Dual Port Multichannel T1 Link Module (BLN and BCN)
- 120 ohm Single Port MCE1-II Net Module (BLN and BCN)
- 120 ohm Single or Dual Port MCE1-II Link Module (ASN)
- QMCT1 Link Module (BLN and BCN)

To select PRI lines:

1. **Begin at the Configuration Manager window (Figure 7-13).**

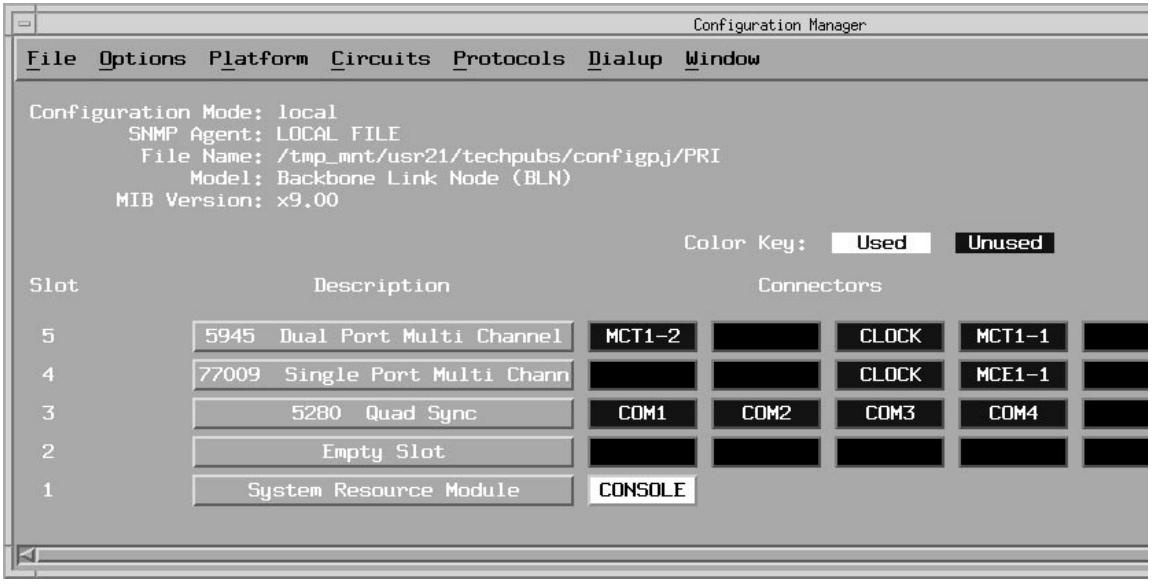

Configuration Manager
File Options Platform Circuits Protocols Dialup Window
Configuration Mode: local
SNMP Agent: LOCAL FILE
File Name: /tmp_mnt/usr21/techpubs/configpj/PRI
Model: Backbone Link Node (BLN)
MIB Version: x9.00
Color Key: Used Unused
Slot
Description
Connectors
5 5945 Dual Port Multi Channel MCT1-2 CLOCK MCT1-1
4 77009 Single Port Multi Chann CLOCK MCE1-1
3 5280 Quad Sync COM1 COM2 COM3 COM4
2 Empty Slot
1 System Resource Module CONSOLE

Figure 7-13. Configuration Manager Window

2. **Click on an MCT1 or MCE1 connector.**

   Site Manager displays the Port Application window (Figure 7-14).

Figure 7-14. Port Application Window for PRI

3. **Set the Port Application mode, referring to the parameter description that follows, and click on OK.**

   For PRI mode, Site Manager displays several windows for MCT1/MCE1 clock, port, and logical line parameters. The next sections describe each of these windows. Once the line parameters are complete, you can proceed to "Creating Line Pools with ISDN Interfaces" on page 7-38.

PRI Port Application Parameter

Use the following description as a guideline when you configure the Port Application Mode.

Parameter:	**Port Application Mode**
Default:	NonPRI
Options:	NonPRI | PRI
Function:	Determines if this interface is a PRI interface. The non-PRI option indicates that this is a standard synchronous interface. The PRI options indicate that this is an ISDN PRI interface.
Instructions:	If your application calls for PRI, select PRI. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.16

Configuring MCT1/MCE1 Clock Parameters

After you choose PRI as the application mode, Site Manager automatically displays the Clock Parameters window (Figure 7-15).

The Clock Parameters window defines the timing sources that apply globally for all connectors and DS0 timeslots supported by the MCT1/E1 Link Module.

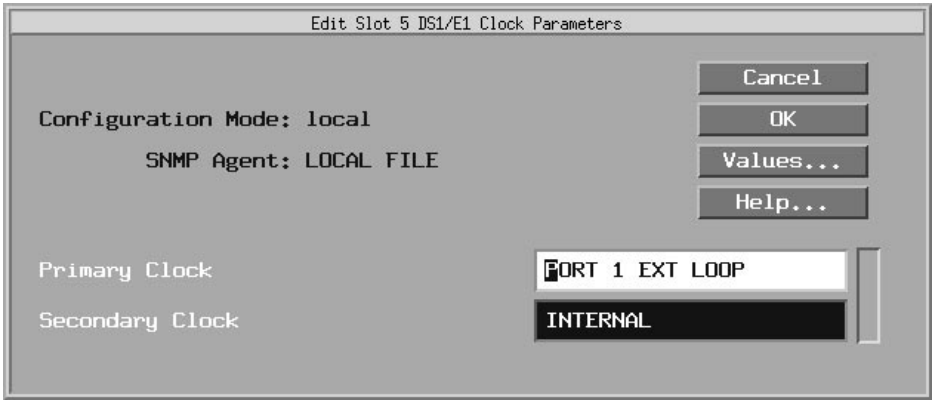


Figure 7-15. Clock Parameters Window

1. **Click on OK to accept the default values or modify the values according to the descriptions in the next section, "MCT1/MCE1 Clock Parameters."**

MCT1/MCE1 Clock Parameters

Use the following descriptions when you configure the clock parameters.

Parameter: **Primary Clock**

Default: Port 1 Ext Loop

Options: Internal │ Port 1 Ext Loop │ Port 2 Ext Loop │ Auxiliary Ext

Function: Identifies the primary source of the timing signals, as follows:

Internal	Uses the clock chip on the link module
Port 1 Ext Loop	Uses the signal coming in from Port 1
Port 2 Ext Loop	Uses the signal coming in from Port 2
Auxiliary Ext	Uses an external source via the BNC connector

Instructions: Specify the source of the primary transmit clock.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.1.1.4

Parameter: **Secondary Clock**

Default: Internal

Options: Internal │ Port 1 Ext Loop │ Port 2 Ext Loop │ Auxiliary Ext

Function: Identifies the secondary source of the timing signals, as follows:

Internal	Uses the clock chip on the link module
Port 1 Ext Loop	Uses the signal coming in from Port 1
Port 2 Ext Loop	Uses the signal coming in from Port 2
Auxiliary Ext	Uses an external source via the BNC connector

The router uses the secondary clock only when the primary clock becomes unavailable.

Instructions: Specify the source of the secondary transmit clock.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.1.1.5

Configuring MCT1/MCE1 Port Parameters

After the clock parameters, Site Manager displays the MCT1 or MCE1 Port Parameters window (Figure 7-16 or Figure 7-17).

The port parameters apply to each of the 23 DS0 channels (MCT1) or 30 DS0 channels (MCE1) provided by an individual MCT1/E1 connector.

1. **Click on OK to accept the default values or modify the parameters according to the parameter descriptions on page 7-25 or page 7-31.**

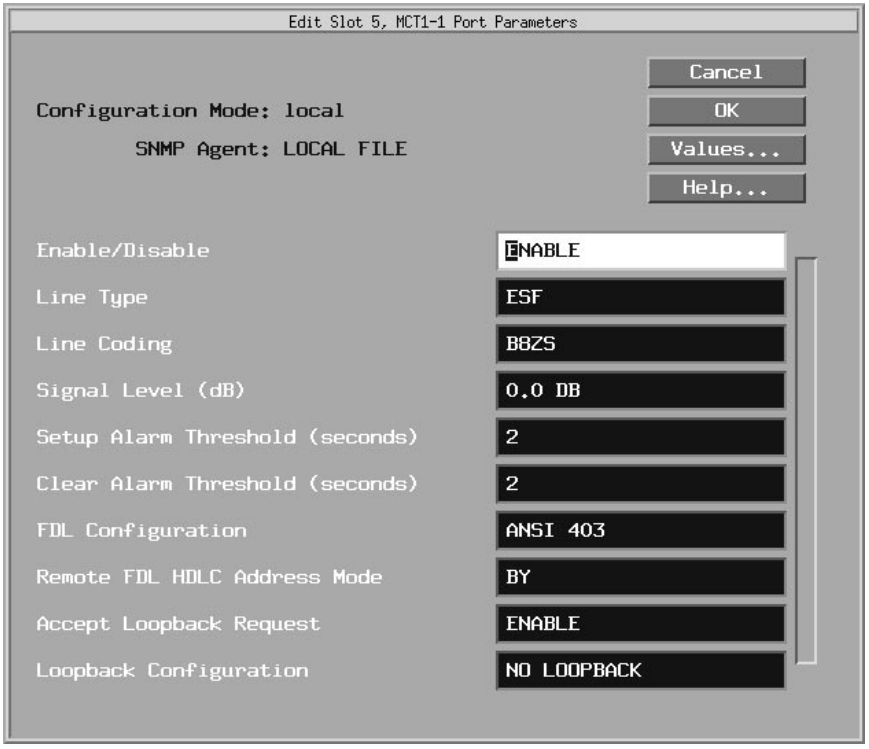


Figure 7-16. MCT1 Port Parameters Window

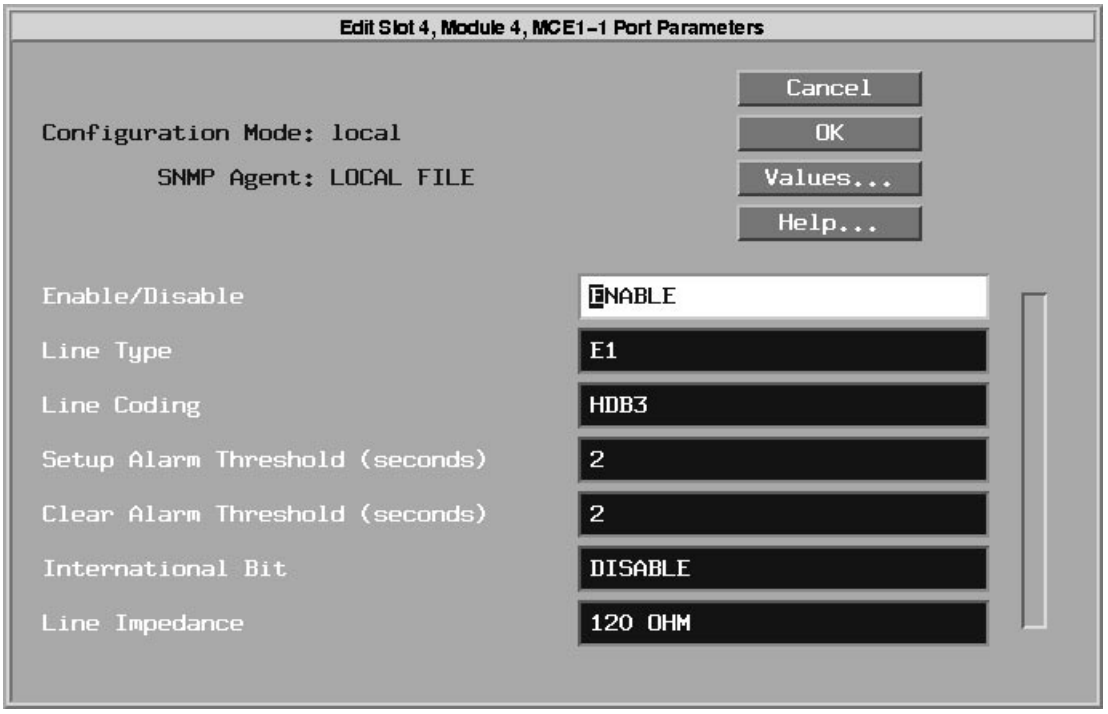


Figure 7-17. MCE1 Port Parameters Window

MCT1 Port Parameters

Use the following descriptions as guidelines when you configure the MCT1 port parameters.

Parameter:	**Enable/Disable**
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables the MCT1 port.
Instructions:	Set to Disable only if you want to disable the MCT1 port.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.2

Parameter: **Line Type**

Default: ESF

Options: Unframed T1 | ESF | SF/D4

Function: Selects either ESF or SF/D4 framing format.

Unframed T1	Use only with BERT mode to match the line type
ESF	Transmits superframes consisting of 24 individual SF/D4 frames and provides enhanced signaling and synchronization
SF/D4	Transmits superframes consisting of 12 individual frames

Instructions: Select the appropriate frame format for your T1 equipment.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.4.1.6

Parameter: **Line Coding**

Default: B8ZS

Options: AMI | B8ZS

Function: Selects a line coding method. AMI line coding is bipolar: a binary 0 is transmitted as zero volts and a binary 1 is transmitted as either a positive or negative pulse, opposite in polarity to the previous pulse. (When configured for AMI line coding, the MCT1 link module remains synchronized upon receiving up to 45 consecutive 0s.)

B8ZS (bipolar with 8-zero substitution) line coding replaces a block of eight consecutive binary 0s with an 8-bit B8ZS code containing bipolar violations in the fourth and seventh bit positions of the substituted code. In the receive direction, the B8ZS code is detected and replaced with eight consecutive binary 0s.

Instructions: Specify the line coding method.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.4.1.7

Parameter: **Signal Level (dB)**

Default: 0.0 dB

Options: -15 dB │ -7.5 dB │ 0.0 dB │ 0.5 dB │ 0.8 dB │ 1.1 dB │ 1.5 dB

Function: Specifies the T1 transmit power level in decibels (dB).

The DS1 values of -15 and -7.5 dB are long-haul and the carrier determines these values if 0.0 dB is not sufficient.

The DSX1 values of 0.0, 0.5, 0.8, 1.1, and 1.5 dB are short-haul and correlate with cable length as follows:

0.0 dB	0 to 133 ft
0.5 dB	133 to 266 ft
0.8 dB	266 to 399 ft
1.1 dB	399 to 533 ft
1.5 dB	533 to 655 ft

Instructions: Specify the decibel level according to the length of the cable or as the carrier specifies.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.3.1.6

Parameter: **Setup Alarm Threshold (seconds)**

Default: 2 seconds

Range: 2 to 10 seconds

Function: Specifies the time interval during which MCT1 tolerates a performance defect or anomaly. If the performance defect or anomaly is still present when this time interval expires, MCT1 records a performance failure and logs an event message.

Instructions: Set the timer value.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.3.1.7

Parameter:	**Clear Alarm Threshold (seconds)**
Default:	2 seconds
Range:	2 to 10 seconds
Function:	Specifies the clear time for performance failure conditions. If the defect or anomaly clears within this time interval, MCT1 records a performance-cleared condition and logs an event message.
Instructions:	Set the timer value.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.8

Parameter:	**FDL Configuration**
Default:	ANSI 403
Options:	ANSI 403 | AT&T 54016 | None
Function:	Selects a Facility Data Link (FDL) mode only when the line is configured with an ESF line type. The default, ANSI 403 mode, conforms to the 1989 ANSI T1.403 specification (*Carrier-to-Customer Installation DS1 Metallic Interface*); AT&T 54016 conforms to the 1989 AT&T specification (*Requirements for Interfacing Digital Terminal Equipment to Services Employing the Extended Superframe Format*).
Instructions:	Specify the operational mode.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.4.1.14

Parameter:	**Remote FDL HDLC Address Mode**
Default:	BY
Options:	AZ | BY
Function:	Selects the FDL address mode to determine whether the near-end FDL responds to HDLC address BY or AZ in messages from the far-end FDL.
Instructions:	Specify the address mode.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.9

Parameter: **Accept Loopback Request**

Default: Enable

Options: Enable │ Disable

Function: Enables or disables loop-up and loop-down code detection circuitry in the link module. When this parameter is enabled, this interface accepts and complies with requests to go into loopback mode from a far-end device.

Instructions: Enable or disable local loopback.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.3.1.10

Parameter: **Loopback Configuration**

Default: No Loopback

Options: No Loopback │ Payload Loopback │ Line Loopback

Function: Setting this parameter forces the DS1 interface into loopback. The far-end or intermediate equipment then performs diagnostics on the network between that equipment and the DS1 interface. After testing, set this parameter to No Loopback to return the interface to normal operation.

Payload Loopback	The received signal at this interface is looped through the device. Typically the received signal is looped back for retransmission after it has passed through the device's framing function.
Line Loopback	The received signal does not go through the framing device (minimum penetration) but is looped back out.

Instructions: Select the loopback configuration option.

MIB Object ID: 1.3.6.1.4.1.18.3.4.9.4.1.10

Parameter:	**Send Performance Measurement CR Addr**
Default:	prmCi
Options:	prmCi | prmCarrier
Function:	Specifies the source of performance messages; prmCi indicates that the customer installation supplies the messages, and prmCarrier indicates that the carrier supplies the messages. You can configure this parameter only for QMCT1 link modules.
Instructions:	Select prmCi or prmCarrier.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.18

Parameter:	**Accept Perf Measurement CR Addr**
Default:	prmCi
Options:	prmCi | prmCarrier
Function:	Specifies the source from which the router accepts performance messages; prmCi indicates that the router accepts messages only from the customer installation, and prmCarrier indicates that the router accepts messages only from the carrier. You can configure this parameter only for QMCT1 link modules.
Instructions:	Select prmCi or prmCarrier.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.19

MCE1 Port Parameters

Use the following descriptions when you configure the MCE1 port parameters.

Parameter:	**Enable/Disable**
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables the MCE1 port.
Instructions:	Set to Disable only if you want to disable the MCE1 port.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.2

Parameter:	**Line Type**
Default:	E1
Options:	E1 | E1 CRC | E1 MF | E1 CRC MF
Function:	Specifies the framing format.
Instructions:	Select the appropriate frame format for your E1 equipment.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.4.1.6

Parameter:	**Line Coding**
Default:	HDB3
Options:	T34AMI | HDB3
Function:	Specifies a line coding method. AMI line coding is bipolar: a binary 0 is transmitted as zero volts and a binary 1 is transmitted as either a positive or negative pulse, opposite in polarity to the previous pulse. (When configured for AMI line coding, the MCE1 link module remains synchronized upon receiving up to 45 consecutive 0s.) HDB3 (high-density bipolar coding) line coding maintains sufficient 1s density in the E1 data stream. It replaces a block of eight consecutive binary 0s with an 8-bit HDB3 code containing bipolar violations in the fourth and seventh bit positions of the substituted code. In the receive direction, the HDB3 code is detected and replaced with eight consecutive binary 0s.
Instructions:	Specify the line coding method.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.4.1.7

Parameter:	**Setup Alarm Threshold (seconds)**
Default:	2 seconds
Range:	2 to 10 seconds
Function:	Specifies the time interval during which MCE1 tolerates a performance defect or anomaly. If the defect or anomaly still exists when the time interval expires, MCE1 records a the failure and logs an event message.
Instructions:	Set the timer value.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.7

Parameter:	**Clear Alarm Threshold (seconds)**
Default:	2 seconds
Range:	2 to 10 seconds
Function:	Specifies the clear time for performance failure conditions. If the defect or anomaly clears within this time interval, MCE1 records a performance-cleared condition and logs an event message.
Instructions:	Set the timer value.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.8

Parameter:	**International Bit**
Default:	Disable
Options:	Enable | Disable
Function:	Specifies whether or not to set the international bit in the E1 frame.
Instructions:	Select Enable to set the international bit, or select Disable.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.15

Parameter:	**Line Impedance**
Default:	120 Ohm
Options:	120 Ohm | 75 Ohm
Function:	Specifies Line impedance for the ASN MCE1 net module. This parameter only appears for the ASN MCE1 module.
Instructions:	Set the line impedance.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.3.1.20

Configuring MCT1/MCE1 Logical Lines

Following the port parameters, Site Manager displays the PRI Logical Lines window (Figure 7-18).

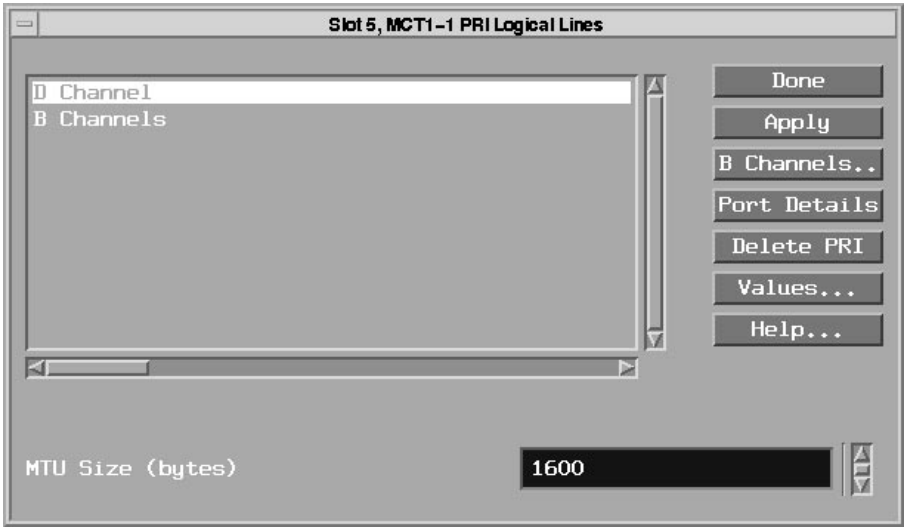


Figure 7-18. PRI Logical Lines Window

The PRI port supports up to 23 (MCT1) or 30 (MCE1) logical lines -- that is, logical ISDN B channels. Circuits run over these B channels. The PRI Logical Lines window lets you add B channels to the PRI interface.

If this is the first time you are configuring a PRI interface, the Timeslots window (Figure 7-19) appears automatically after the Logical Lines window.

Note: The MCE1 Timeslots window looks the same; however, there are a total of 30 B channels and 1 D channel.

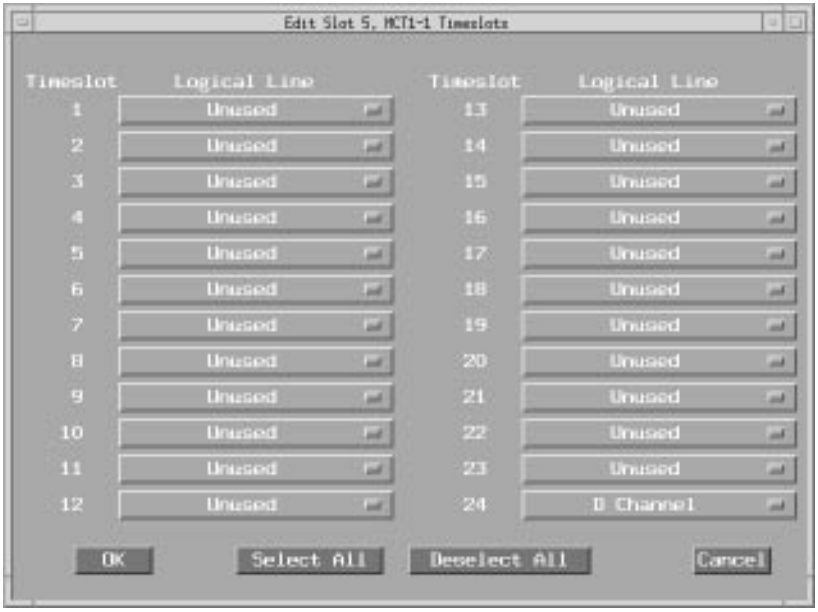


Figure 7-19. MCT1 Timeslots Window

Configure B channels as follows:

1. **Click on Select All to automatically change all the timeslots to B channels. Click on individual timeslots only if you have purchased selective PRI service from your provider.**

Note: Select only the timeslots that the service provider assigns to you. For example, if your provider gives you timeslots 1 through 10, select slots 1 through 10 in the Timeslots window.

If you click on an individual timeslot, a pull-down menu appears with two options (Figure 7-20).

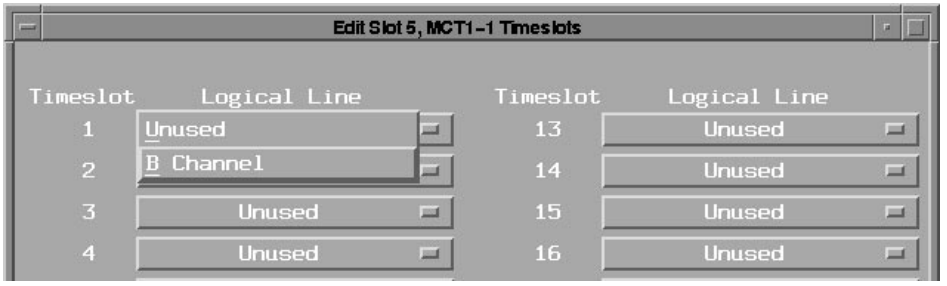


Figure 7-20. Pull-Down Menu for PRI Timeslot

2. **Select B Channel to configure the timeslot.**

   Site Manager changes the timeslot accordingly (Figure 7-21).

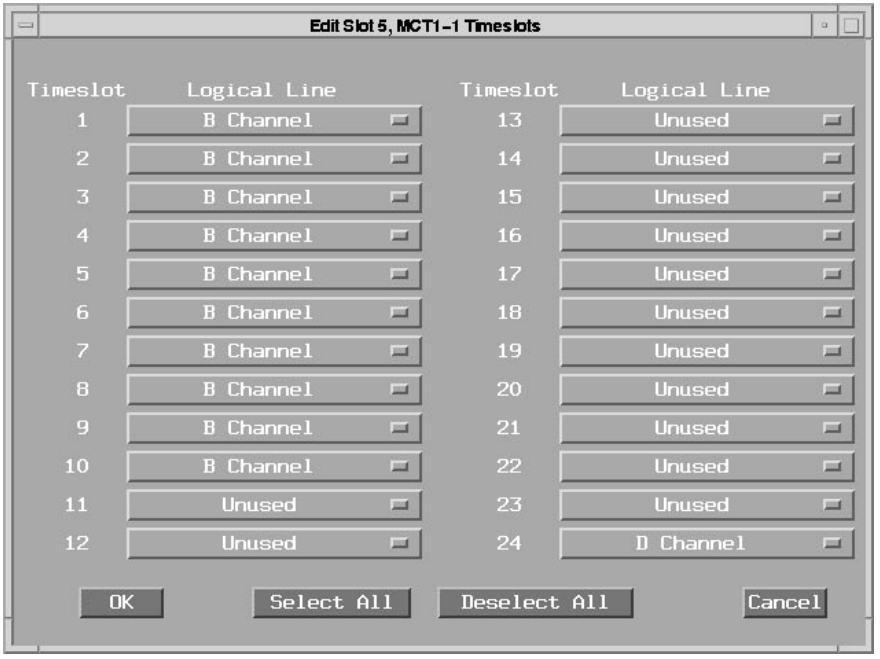


Figure 7-21. Timeslot Selected for B Channels

3. **Click on OK after you select all the lines you want.**

Site Manager returns you to the PRI Logical Lines window.

4. **Accept the default MTU size or modify the parameter according to the parameter description that follows.**

Now that you have set the line parameters for the MCT1 or MCE1 lines, they can become part of a line pool.

Logical Lines Parameter

Use the following description as a guideline when you configure the MTU Size.

Parameter:	**MTU Size (bytes)**
Default:	1600 bytes
Range:	3 to 4608
Function:	Specifies the Transmit/Receive buffer size, which determines the largest frame that the router can transmit or receive across this port on the MCT1 Link Module. The router discards frames larger than the maximum transfer unit.
Instructions:	Enter the maximum transfer unit.
MIB Object ID:	1.3.6.1.4.1.18.3.4.9.6.1.55

Creating Line Pools with ISDN Interfaces

At this point, the instructions for configuring line pools are the same for BRI and PRI interfaces. To set up line pools:

1. **Select either Dialup > Demand Pools, Backup Pools, or Bandwidth-on-demand Pools from the Configuration Manager window.**

   Site Manager displays a Pools window similar to Figure 7-2 on page 7-4.

2. **Click on Add.**

   Site Manager displays the Pool Configuration window (refer to Figure 7-3).

3. **Enter a pool ID, referring to the parameter description on page 7-9, and click on OK.**

   Site Manager shows the Lines Definition window, Figure 7-4 on page 7-5.

4. **Click on a line to assign to it the pool. Do not select a previously configured leased line.**

   For bandwidth-on-demand pools, you may select lines across a maximum of three slots.

   Site Manager then prompts you for the switch type by displaying the ISDN Switch Configuration window (Figure 7-22).

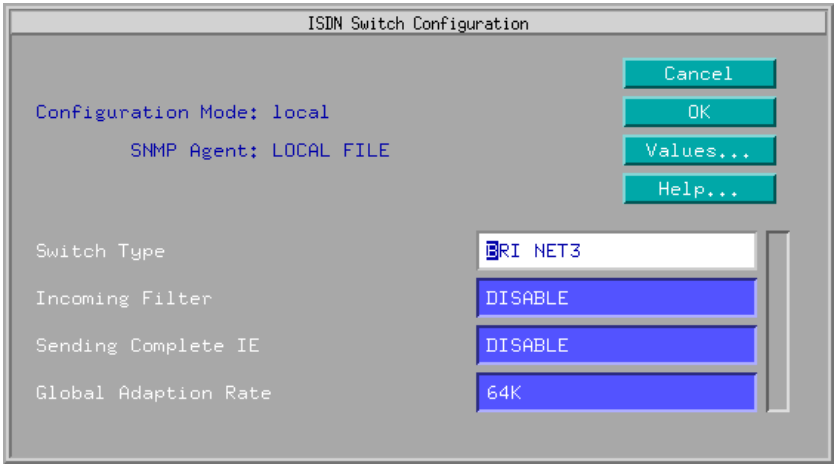


Figure 7-22. ISDN Switch Configuration Window

5. **Accept the default values or enter new values for these fields, using the descriptions following this procedure; then click on OK.**

Note: Once you select a switch, Site Manager bypasses the ISDN Switch Configuration window for subsequent ISDN lines.

ISDN Switch Parameter Descriptions

Use the following descriptions when you configure the ISDN switch parameters.

Parameter:	**Switch Type**
Default:	BRI NET3 | PRI Net5
Options:	BRI NET3 | BRI SWISSNET3 | BRI 5ESS | BRI DMS100 | BRI KDD | BRI NTT | BRI TS013 | BRI NI1 | PRI 5ESS | PRI DMS100 | PRI 4ESS | PRI KDD | PRI NTT | PRI Net5 | PRI TS014
Function:	Specifies the type of ISDN switch to which you are connecting.
Instructions:	Choose the appropriate ISDN switch. Refer to Table 7-1 on page 40.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.6.1.3

Note: Site Manager displays only those switch options for the interface you are configuring. For example, if you are setting up a BRI interface, you will see only the BRI switches when you click on Values. In addition, if you are communicating with a Version 8.10 router, you will only see the BRI switches supported for Version 8.10 software.

Table 7-1. Switch Types by Country

Country	BRI Switch Types	PRI Switch Types
Austria Belgium Denmark France Germany Italy Netherlands Norway Spain Sweden United Kingdom	BRI NET3	PRI NET 5
Switzerland	BRI SWISSNET3	PRI NET 5
United States	BRI 5ESS, BRI NI1 BRI DMS100	PRI 4ESS, PRI 5ESS, PRI DMS 100
Canada	BRI NI1, BRI DMS100	PRI DMS100
Japan	BRI KDD, BRI NTT	PRI KDD, PRI NTT
Australia	BRI TS013	PRI TS014
Finland Greece Iceland Ireland Luxembourg Portugal		PRI NET 5

Parameter:	**Incoming Filter**
Default:	Disable
Options:	Enable | Disable
Function:	The incoming filter enables the security feature call screening. It compares the phone number of the calling party to the phone numbers you previously entered in the incoming phone list, described in Chapter 11. You must purchase calling line ID service so that the provider includes the calling party's number in the call setup message.
Instructions:	Enable this parameter if you want the router to filter all incoming calls based on the calling party's number. Disable this parameter if the router should not screen calls or the switch does not include the calling party's number in the incoming call.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.6.1.5

Parameter:	**Sending Complete IE**
Default:	Disable
Options:	Enable | Disable
Function:	Informs the router to include the sending complete information element (IE) in the outgoing call setup message to the network.
Instructions:	Select Enable if you want to include this IE in the call setup message, and if your ISDN switch supports this IE. By including this IE in the call setup message, call setup times may be faster. If your ISDN switch does not support this IE, accept the default, Disable.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.6.1.8

Parameter:	**Global Adaption Rate**
Default:	64K
Options:	64K | 56K
Function:	In accordance with the ITU-T (formerly CCITT) V.110 standard, this parameter enables the router to send and receive data transmitting at a rate of 56 Kb/s and adapt it for transmission over a 64 Kb/s line.
Instructions:	Specify the data rate that the router sends and receives calls over a B channel. Ensure that the rate is compatible with the network connections to the destination device. Ask your provider if you are unsure. If the value of this parameter is greater than the value of the outgoing call's Adaption Rate parameter, the router ignores this parameter and uses the outgoing call's data rate. For example, if this parameter is set to 64 Kb/s and the Adaption Rate is set to 56 Kb/s, the router uses the rate of 56 Kb/s for the outgoing call. If the parameter values are equal, or only this parameter is set, the router uses this parameter value and ignores the outgoing call's value. If no value is set for either parameter, the router uses the default, 64 Kb/s.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.6.1.9

Configuring ISDN Logical Lines

After you choose a switch, Site Manager automatically displays the ISDN Logical Lines window (Figure 7-23).

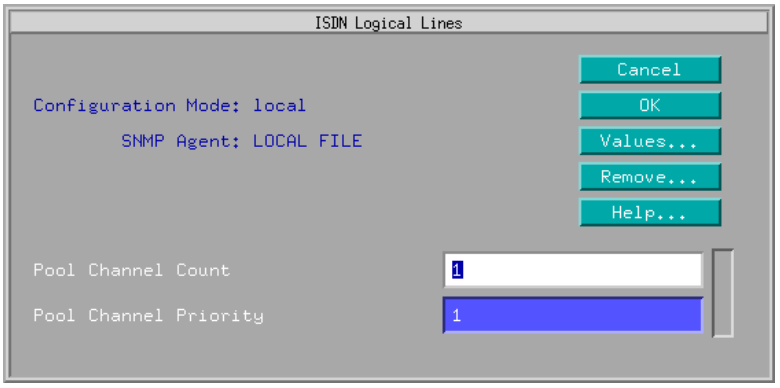


Figure 7-23. ISDN Logical Lines Window

This window enables you to define the number of B channels in the line pool as well as assign a priority to a pool.

To configure logical lines in the line pool:

1. **Enter values for these parameters, using the descriptions that follow these procedures.**
2. **Click on OK to save.**

   Site Manager returns you to the Lines Definition window (Figure 7-8).

   On the COM ports, the letter **D** (demand), **B** (backup), or **W** (bandwidth-on-demand) appears next to the connector name to indicate the type of line it is.
3. **Select File > Exit from the Lines Definition window.**

   The Pools window reappears with the configured pool listed (Figure 7-24). The window also has three new buttons (Edit, Apply, and Delete).

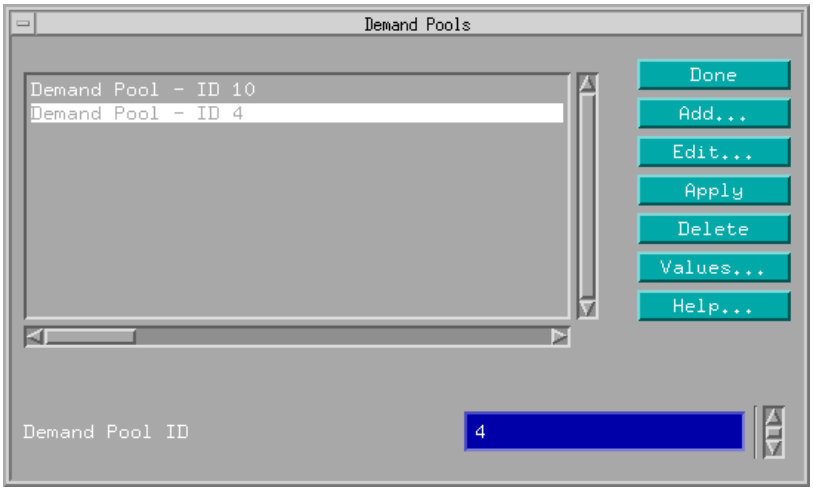


Figure 7-24. Configured Demand Pool

4. **Add more pools if you need them.**

   Repeat the procedures in the previous sections "Creating Line Pools with ISDN Interfaces," on page 7-38 and "Configuring ISDN Logical Lines," on page 7-43.

5. **Click on Done when you finish adding pools and lines.**

   Site Manager returns you to the Configuration Manager window.

Logical Lines Parameters

Use the following descriptions for configuring the ISDN logical lines parameters.

Parameter:	**Pool Channel Count**
Default:	Available B channels
Range:	1 to 2 (BRI) | 1 to 23 (PRI – MCT1) | 1 to 30 (PRI – MCE1) The channel count range for PRI depends on the number of B channels you selected in the Timeslots window (refer to Figure 7-21) and the number out of this total that you assign to each pool. For example, if you have a total of 20 B channels and 5 of those channels are configured for Pool 1, the range of this parameter for Pool 2 is 1 through 15 channels. Five of the original 20 are not available because they are used by Pool 1.
Function:	Determines the number of B channels in the line pool.
Instructions:	Enter the number of B channels that you want in the line pool. If you are configuring a multirate call, be sure that the value for this parameter is not less than the maximum value that you can set for the Aggregate Bandwidth parameter, which you configure when you set up an outgoing phone list. For example, if the aggregate bandwidth is 256 Kb/s, the value for this parameter should be 4.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.11.1.5

Parameter:	**Pool Channel Priority**
Default:	1
Range:	1 to 50
Function:	Prioritizes a group of lines in the same pool. For example, the router uses a line of priority 1 before it uses a line of priority 2. For dial backup and bandwidth-on-demand pools, lines can reside across slots, but when you set this parameter, it affects only lines on the same slot. In the case of dial backup, if you have two lines in Slot 3 and three lines in Slot 4, the router sets a priority between the lines in Slot 3, then sets a priority between the lines in Slot 4. For bandwidth-on-demand, the router prioritizes lines in the preferred slot, then the reserved, and finally the local slot.
Instructions:	Assign a number to each pool. The lower the number, the higher the priority. Note that if you have a pool that combines Raise DTR/V.25bis lines with ISDN lines, you should coordinate the priority assignments for this interface with those you set via the Priority parameter for the Raise DTR/V.25bis interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.11.1.6

Local Phone Numbers (ISDN Only)

The local phone numbers option identifies the calling router's phone number in the ISDN outgoing call setup message. Your ISDN service provider assigns you this number, and it identifies the local router to remote routers on the network.

To enter the phone number of your router:

1. **Select Dialup > Local Phone Numbers.**

   Site Manager displays the ISDN Local Phone Lines window (Figure 7-25).

Figure 7-25. ISDN Local Phone Lines Window

2. **Click on Local Phones.**

   The ISDN Local Phone Numbers window appears (Figure 7-26).

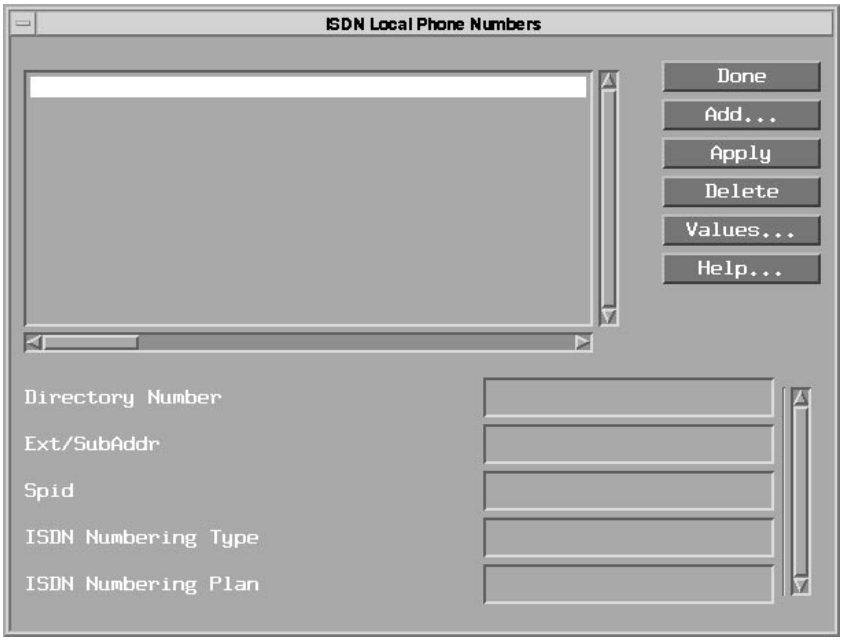


Figure 7-26. ISDN Local Phone Numbers Window

Note that the SPID parameter appears in the Local Phone Number window only if you configured a switch type used in the United States or Canada.

3. **Click on Add, then enter the values in the Phone Number window (Figure 7-27), referring to the parameter descriptions on page 7-51.**

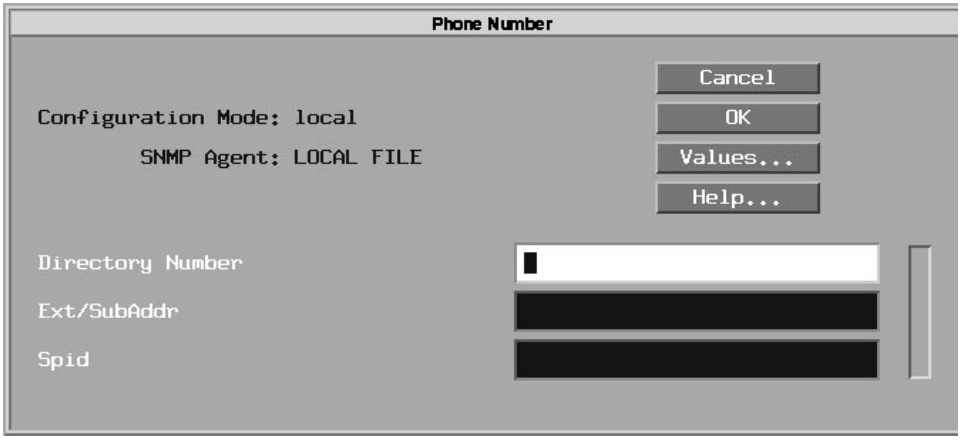


Figure 7-27. Phone Number Window

4. **Click on OK to save the numbers.**

   Site Manager returns you to the ISDN Local Phone Numbers window with the completed phone entry (Figure 7-28).

   If you highlight the phone entry in the scroll box, Site Manager automatically fills in the fields below it.

Figure 7-28. Configured ISDN Local Phone Numbers Window

5. **Click on Done until you return to the Configuration Manager.**

Local Phone Number Parameters

Use the following descriptions when you set the local phone number parameters.

Parameter:	**Directory Number**
Default:	None
Options:	A maximum of 20 numeric characters
Function:	Specifies the phone number of the router. The value of this parameter must match the phone number that your service provider assigns to you when you receive ISDN service. Any remote party that calls the router must include this directory number in the Called Party IE field of the call setup message. The Called Party IE must match the directory number exactly or the router will not answer the call.
Instructions:	Enter the phone number your ISDN provider supplied when you received ISDN service. For switches used in the United States, do not include the area code when you enter the phone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.12.1.4

Parameter:	**Ext/SubAddr**
Default:	None
Options:	A maximum of 25 numeric characters
Function:	Specifies a subaddress or an extension line for a main phone number that further identifies the local router. The subaddress is useful when you have several routers at a destination site, but the ISDN provider assigns only one phone number to the destination site. An incoming call has to specify the number and the subaddress to reach a specific router.
Instructions:	Enter the extension/subaddress. You may assign this number or your ISDN provider may assign it when you receive ISDN service. Do not enter space, special, or alphabetical characters in the telephone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.12.1.5

Parameter:	**SPID**
Default:	None
Options:	A maximum of 20 numeric characters
Function:	For only switch types used in the United States and Canada, the Service Profile Identifier (SPID) identifies a specific ISDN device to the switch, so the switch knows what services to provide.
Instructions:	Enter the SPID your ISDN provider supplied when you received ISDN service. You do not have to enter a value for this parameter if you have a 5ESS switch on a point-to-point line.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.12.1.6

Parameter:	**ISDN Number Type**
Default:	Unknown
Options:	Unknown | International | National | Specific | Subscriber | Abbreviated
Function:	Indicates the standard that the phone number format follows. The router passes this information to the ISDN switch.
Instructions:	Accept the default value, Unknown, unless your service provider explicitly instructs you to use another value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.12.1.8

Parameter:	**ISDN Number Plan**
Default:	Unknown
Options:	Unknown | Telephony | X121 | Telex | Standard | Private
Function:	Indicates the standard that the phone number plan follows. The router passes this information to the ISDN switch.
Instructions:	If you set the Switch Type parameter to BRI NTT, BRI KDD, or BRI NI1, accept the default value, Unknown. For all other switch types, Site Manager uses the value Telephony. Accept this value unless your service provider explicitly instructs you to use another value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.12.1.9

Configuring BRI Leased Line (Germany Only)

If the ISDN service provider does not use the D channel for call setup or you can use leased ISDN lines at an economical rate, you may configure your ISDN line to act as a leased line. To do this, follow these procedures.

1. **From the Configuration Manager, click on an ISDN connector.**
2. **Select a leased option for the port application mode, and click on OK.**

   Site Manager displays the ISDN Leased Line B Channels window (Figure 7-29).

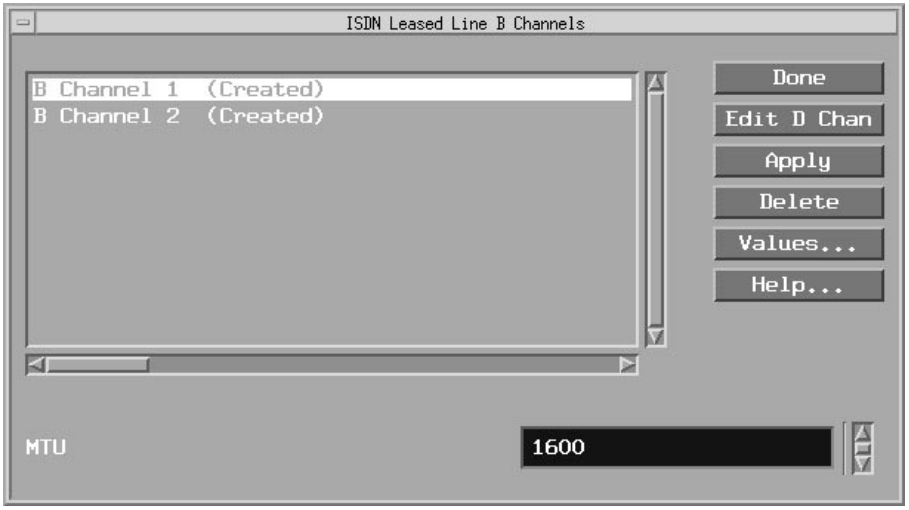


Figure 7-29. ISDN Leased Line B Channels Window

3. **Click on Done to exit.**

   Site Manager configures the B channels as leased lines, then displays the Add Circuit window.

4. **Click on an ISDN connector in the Add Circuit window.**

   Site Manager enters a circuit name in the Circuit Name parameter. Accept this name or enter your own circuit name.

5. **Click on OK to save.**

   Site Manager displays the WAN Protocols menu (Figure 7-30).

Figure 7-30. WAN Protocols Menu

6. **Select a WAN protocol and click on OK.**

   Site Manager returns you to the Configuration Manager window and prompts you to select a LAN protocol.

7. **Select the LAN protocol and click on OK.**

   Your ISDN leased-line configuration is complete.

Editing the D Channel for Leased-Line Configurations

Although call setup is not performed on the D channel, the ISDN switch uses the D channel to send and receive bits that activate and deactivate the ISDN interface. Therefore, you can edit the D channel for your leased-line configuration.

If noise or other minor problems on the ISDN line are causing the router to bring the line down frequently, you can set the BRI T4 Timer to prevent this from happening. To edit this timer:

1. **From the Configuration Manager, click on an ISDN connector that you previously configured as a leased line.**

   Site Manager displays the ISDN Leased Line B Channels window (refer to Figure 7-29).

2. **Click on Edit D Chan.**

   Site Manager displays the BRI Interface Configuration window (similar to Figure 7-33 on page 7-59).

3. **Enter a new value for the BRI T4 Timer according to the parameter description.**

Parameter:	**BRI T4 Timer**
Default:	750 milliseconds
Range:	500 to 1000 milliseconds
Function:	Indicates the amount of time the router waits for the line to recover from a deactivated state. This timer prevents brief, minor disturbances on a noisy line from forcing the router to deactivate the circuit. Instead, the router waits to see if the line recovers within the T4 timer period. This enables the router to suppress minor line problems from the upper-layer protocols.
Instructions:	Enter a time limit that the router waits for the line to come back up before deactivating the circuit. If your line is particularly noisy, enter the maximum time for the router to wait for the line to reactivate.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.9.1.15

Modifying Line Pool Configurations

The sections that follow provide instructions for modifying your line pool configuration.

Changing Pool IDs and Lines

Before you can delete or change a pool ID, you must first delete all circuits associated with that pool. Refer to Chapter 8 for instructions.

To delete or change any line pool:

1. **Select Dialup > Demand, Backup, or Bandwidth-on-Demand Pools from the Configuration Manager window.**

   Site Manager displays the Pools window (refer to Figure 7-24).

   - To change a pool ID, highlight the ID entry in the Pools window. Enter the new pool ID in the Pool ID parameter and click on Apply. The new pool ID appears in the Pools window.
   - To delete a line pool, highlight the ID in the Pools window and click on Delete. The pool is deleted from the router.

2. **Click on Done in the Pools window when you finish modifying pool IDs.**

To remove a dial service from an ISDN line, refer to "Modifying the Logical Lines Configuration" on page 7-62.

To remove a dial service from a COM line or to add additional lines to a pool:

1. **Select Dialup > Demand, Backup, or Bandwidth-on-Demand Pool ID from the Configuration Manager window.**

   Site Manager displays the Pools window (refer to Figure 7-24).

2. **Highlight the pool ID of the lines you want to modify. Click on Edit.**

   The Lines Definition window (refer to Figure 7-4) appears.

   - To remove a dial service from a line, click once on the line. If this is the only line in the pool, the Site Manager deletes the pool as well.
   - To add additional lines, repeat the steps in "Creating Line Pools with Raise DTR and V.25bis Interfaces" (page 7-3) or "Creating Line Pools with ISDN Interfaces" (page 7-38).

3. **Select File > Exit.**

   Site Manager returns you to the Pools window (refer to Figure 7-24).

4. **Click on Done in the Pools window when you finish modifying lines.**

Caution: If you make changes to a line that is carrying an active circuit, the router terminates the circuit.

Changing the WAN Interface and Line Media Type

To edit the WAN interface type and the line media parameters, follow these steps.

1. **Click on the COM port you want to edit.**

   Site Manager displays the Edit Connector window (refer to Figure 7-10).

2. **Click on Edit Line.**

   Site Manager displays the Synchronous Line Details window where you will find the WAN Serial Interface parameter as well as the Line Media Type and Cable Type parameters.

Editing the ISDN Switch Configuration

If you change the Switch Type parameter, the router's ISDN software makes changes to account for the new switch type. Any existing calls are disconnected as the ISDN port reinitializes. Once the changes are made, the software restarts and you can reconnect.

To modify the configuration of the ISDN switch:

1. **Select Dialup > Edit Switch Parameters.**

   Site Manager displays the ISDN Configured Switches window (Figure 7-31).

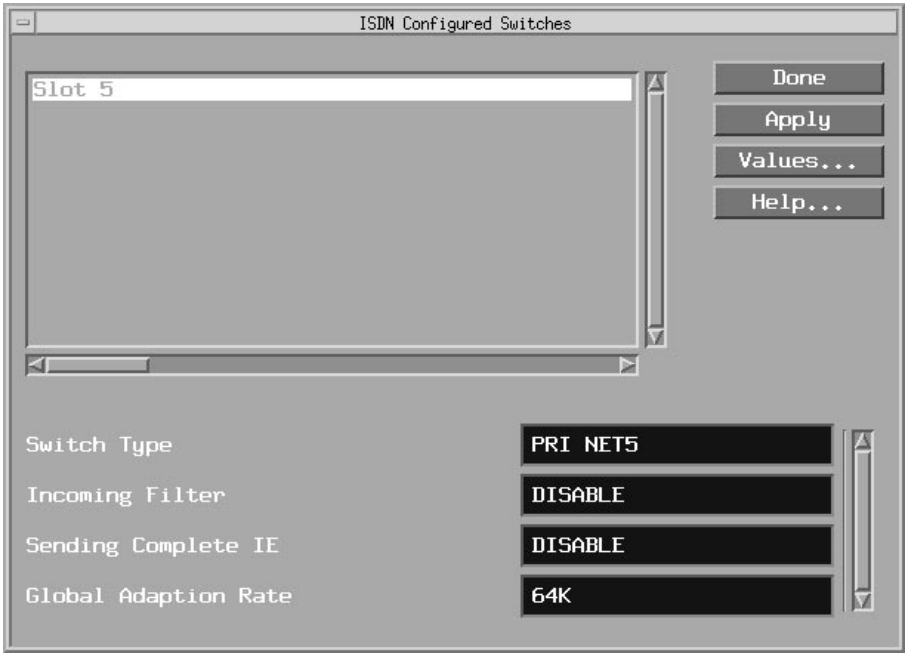


Figure 7-31. ISDN Configured Switches Window

2. **Modify the parameter values according to the descriptions on page 7-39.**
3. **Click on Done.**

   Site Manager returns you to the Configuration Manager window.

Modifying the D Channel for BRI Lines

In most cases, the default settings for the D channel will work for your network. If, however, you want to edit the D channel, follow these instructions.

Note: You cannot modify the D channel until you configure the B channel.

1. **From the Configuration Manager window, click on a configured ISDN connector, that is, one with a D, B, or W next to it.**

   Site Manager displays the ISDN B Channels window (Figure 7-32).

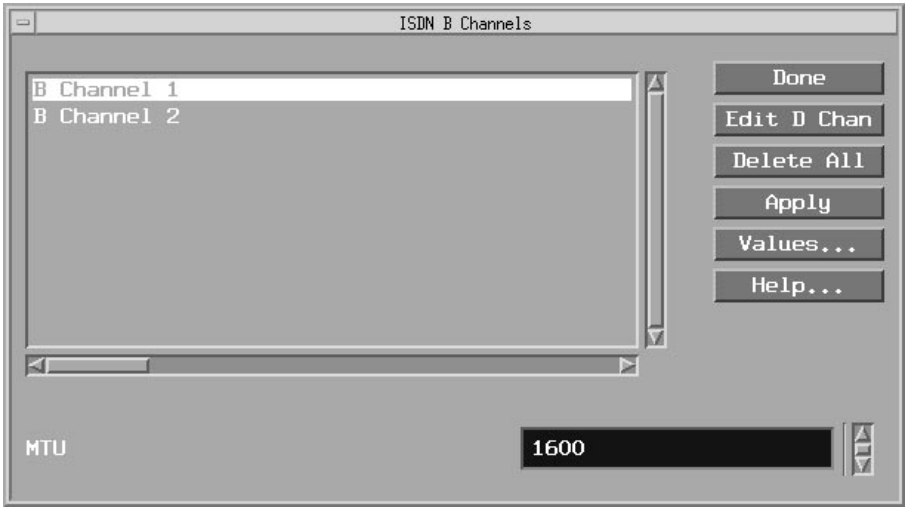


Figure 7-32. ISDN B Channels Window

2. **Click on one of the B channels, then click on Edit D Chan.**

   Site Manager displays the BRI Interface Configuration window (Figure 7-33).

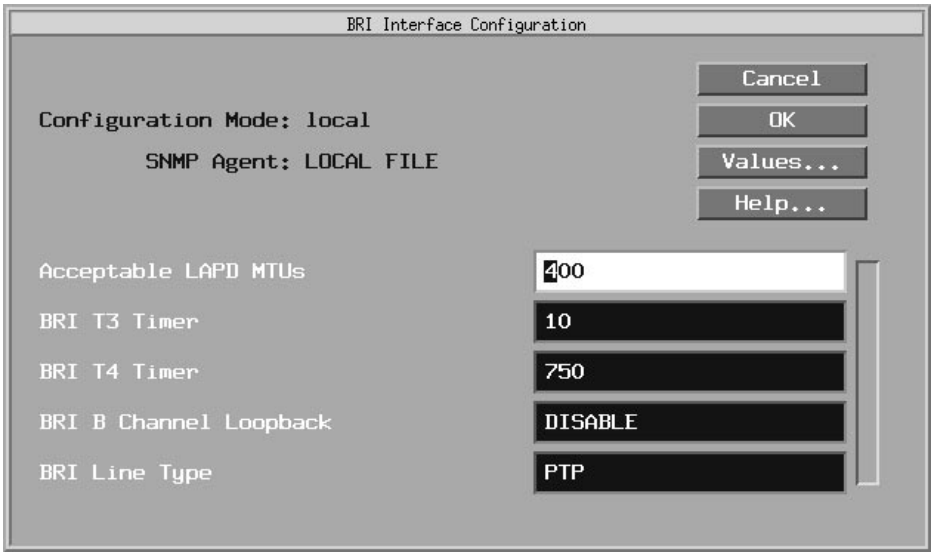


Figure 7-33. BRI Interface Configuration Window

3. **Edit the parameters according to descriptions that follow these procedures and click on OK.**
4. **Click on Done to return to the Configuration Manager.**

BRI Parameter Descriptions

Use the following descriptions when you configure the BRI parameters.

Parameter:	**Acceptable LAPD MTUs**
Default:	400 bytes
Range:	3 to 1024 bytes
Function:	Specifies the maximum number of bytes per LAPD transmission unit.
Instructions:	Enter a value for the maximum MTUs. We recommend that you accept the default value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.9.1.12

Parameter:	**BRI T3 Timer**
Default:	10 seconds
Range:	1 to 30 seconds
Function:	Indicates the amount of time that the router has to try to activate the S/T interface. The router starts this timer while the S/T interface is deactivated and the router tries to activate it -- for example, when the router wants to send data. During this time period, the router sends INFO 1 frames across the S/T interface until the network responds with a signal or the timer expires. This timer prevents the router from attempting to activate the S/T interface interminably.
Instructions:	Enter a time limit that is sufficient for the router to activate the S/T interface. This value should be greater than the time it would take to activate the S/T interface under normal conditions. You may want to ask your ISDN provider for guidelines regarding the subscriber loop transmission, which might affect the value you enter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.9.1.14

Parameter:	**BRI T4 Timer**
Default:	750 milliseconds
Range:	500 to 1000 milliseconds
Function:	Indicates the amount of time the router waits for the line to recover from a deactivated state. This timer prevents brief, minor disturbances on a noisy line from forcing the router to deactivate the circuit. Instead, the router waits to see if the line recovers within the T4 timer period. This enables the router to suppress minor line problems from the upper-layer protocols.
Instructions:	Enter a time limit that the router waits for the line to come back up before it deactivates the circuit. If your line is particularly noisy, enter the maximum time for the router to wait for the line to reactivate.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.9.1.15

Parameter:	**BRI B Channel Loopback**
Default:	Disable
Options:	Enable | Disable
Function:	This parameter is for Layer 1 ISDN BRI conformance testing. It allows external equipment to send data to the router over the B channels and loop it right back out the S/T interface. By doing this, the external equipment can verify the physical connection between its equipment and the router.
Instructions:	Select Enable if you want to run a loopback test between the network and the S/T interface on the router. Note that you should never enable this parameter when the router is in normal operational mode.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.9.1.13

Parameter:	**BRI Line Type**
Default:	PTP
Options:	PTP | MTP
Function:	Indicates whether or not you have a point-to-point (PTP) or a multipoint (MTP) configuration on the BRI line.
Instructions:	Enter the value that indicates the type of line supplied by your network provider. If you have a point-to-point line connected to a 5ESS switch, you do not have to configure SPIDs. (Refer to the SPID parameter on page 7-52.)
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.8.9.1.33

Modifying the Logical Lines Configuration

Before you can delete or change the logical lines in a pool, first delete all circuits associated with that pool. Refer to Chapter 8 for instructions.

You can modify the logical lines by following these steps:

1. **Select Dialup > Demand, Backup, or Bandwidth On Demand Pools from the Configuration Manager window.**

   Site Manager displays the Pools window (refer to Figure 7-2).

2. **Highlight the pool ID that has the ISDN lines you want to modify and click on Edit.**

   Site Manager displays the Lines Definition window (refer to Figure 7-4).

3. **Click on the ISDN or MCT1/E1 connector and Site Manager displays the ISDN Logical Lines window (refer to Figure 7-23 on page 7-43).**

4. **From the ISDN Logical Lines window you can**

   - Edit the pool channel count and priority.
   - Click on Remove to delete ISDN service from a line.

5. **Click on OK to exit the ISDN Logical Lines window. Select File > Exit to exit the Lines Definition window.**

6. **Click on Done to return to the Configuration Manager.**

Editing the MCT1/E1 Port Parameters and Timeslots

From the Configuration Manager, you can click on an MCT1/E1 connector and Site Manager displays the Logical Lines window. From the Logical Lines window, you can edit the port parameters and the timeslots.

Port Parameters

To edit port parameters:

1. **From the Logical Lines window, click on Port Details.**

   Site Manager displays the Port Parameters window (refer to Figure 7-16).

2. **Enter new values and click on OK.**
3. **Click on Done to exit the Logical Lines window.**

Timeslots

To edit timeslots:

1. **Click on B Channels from the Logical Lines window.**

   Site Manager displays the Timeslots window.

2. **Modify the slots and click on OK.**

   Site Manager returns you to the Logical Lines window.

3. **Click on Apply to save the changes.**
4. **Click on Done to exit.**

Editing the Local Phone Number

To edit the local phone number for the B channel that you configured earlier, follow these steps.

1. **Select Dialup > Local Phone Numbers. Site Manager displays the ISDN Local Phone Lines window (Figure 7-34).**

Figure 7-34. ISDN Local Phone Lines Window

2. **Highlight the proper slot and click on Local Phones.**

   Site Manager displays the ISDN Local Phone Numbers window (refer to Figure 7-28).

3. **Enter a new or revised number and click on Apply to save the changes. Click on Done to exit.**

4. **Continue clicking on Done to return to the Configuration Manager window.**

Deleting BRI and PRI Configurations

You must delete the dial-up circuits and pools that use the connector before you delete this physical interface.

BRI

To delete all BRI B channels from the line pool:

1. **Begin at the Configuration Manager and click on the ISDN connector.**

   Site Manager displays the B Channels window (refer to Figure 7-32 on page 7-58).

2. **Click on Delete All, then click on Done.**

PRI

To delete the entire PRI interface:

1. **Click on an MCT1/E1 connector.**

   Site Manager displays the Logical Lines window.

2. **Click on Delete PRI.**

   This deletes the entire PRI configuration from this interface.

Chapter 8
Configuring Demand Circuits

When you configure dial-on-demand service, you must set up circuits that run over the demand lines. This chapter describes how to configure individual demand circuits and demand circuit groups.

Configuring Demand Circuits

To configure demand circuits:

1. **Select Dialup > Demand Circuits from the Configuration Manager window to display the Demand Pools window (Figure 8-1).**

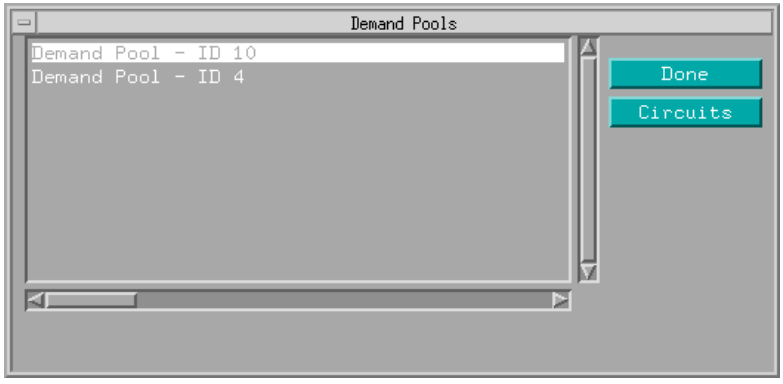


Figure 8-1. Demand Pools Window

2. **Highlight a demand pool and click on Circuits.**

   The Demand Circuits window appears (Figure 8-2).

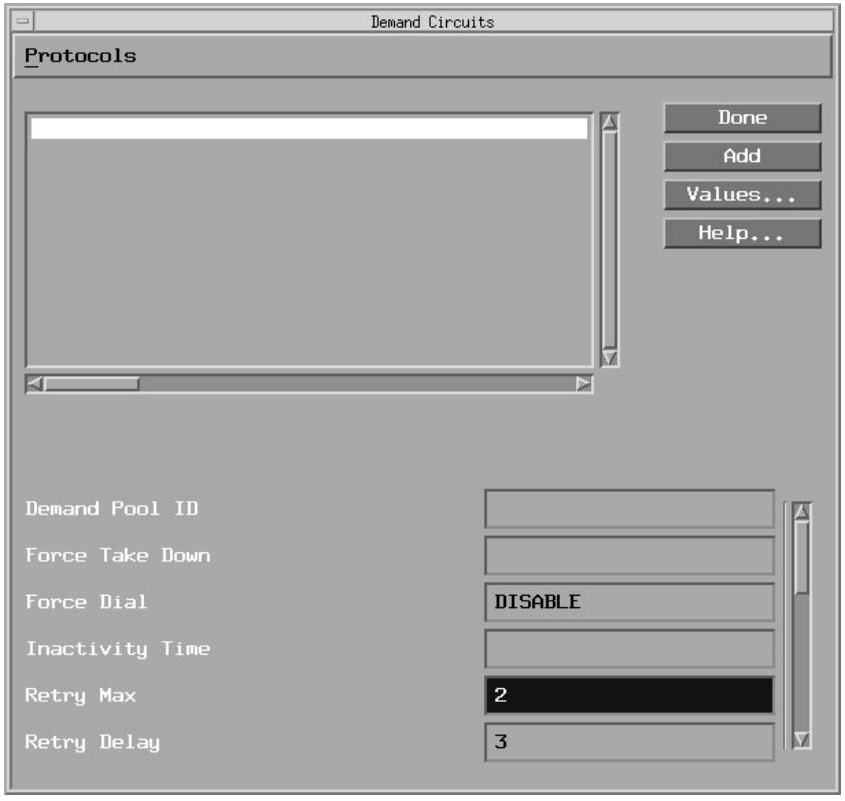


Figure 8-2. Demand Circuits Window

3. **Click on Add to add a demand circuit.**

   Site Manager redisplays the Demand Circuits window with the new circuit listed and the default values filled in (Figure 8-3).

   The circuit uses the lines in the demand pool that you previously selected.

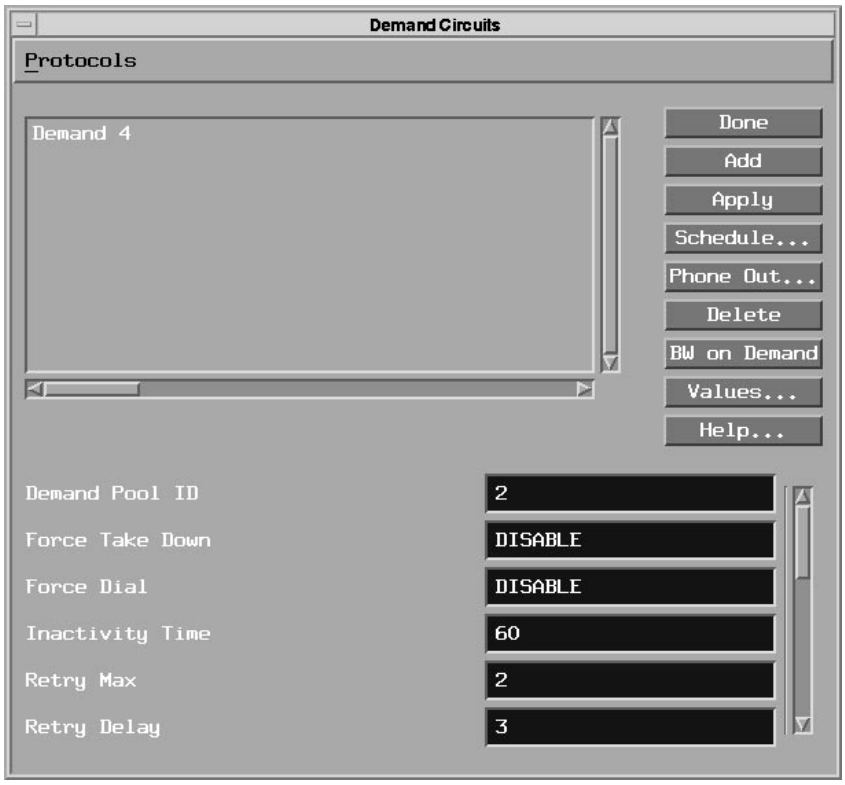


Figure 8-3. Demand Circuits Window with Circuit Added

4. **Repeat Step 3 to add more demand circuits.**
5. **Edit the circuit defaults, referring to "Editing Demand Circuit Parameters" on page 8-4.**
6. **Click on Done to return to the Demand Pools window.**

When you configure demand circuits, Site Manager automatically creates a special PPP record for the demand circuits. This is a generic record that the demand circuit uses to identify who is calling the router. This record appears in the PPP Interface Lists window as follows:

```
Interface for Dialup Lines
```

For more information about PPP, refer to *Configuring PPP Services*.

Editing Demand Circuit Parameters

After you assign a demand circuit to a pool, Site Manager adds several buttons (Apply, Schedule, Phone Out, Delete) to the Demand Circuits window that allow you to edit the default parameters.

To edit the circuit parameters, you must

1. **Highlight the circuit in the Demand Circuits window (refer to Figure 8-3).**
2. **Enter new values for the parameters you want to edit using the parameter descriptions following these procedures.**
3. **Click on Apply to save the changes.**

Selecting CHAP or PAP for the Demand Circuit

CHAP is the default authentication protocol. To select PAP, you must go to the PPP Interface List window, select the special line record for dial lines, and specify PAP in the Local Authentication Protocol parameter. For more information about PPP and configuring authentication protocols, see *Configuring PPP Services*.

Demand Circuit Parameters

Use the following descriptions as guidelines when you configure the demand circuit parameters.

Parameter:	**Demand Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the demand pool associated with the demand circuit.
Instructions:	Enter the ID number of the configured demand pool that you want this circuit to use.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.6

Parameter:	**Force Take Down**
Default:	Disable
Options:	Enable | Disable
Function:	When set to Enable, this parameter forces the router to immediately terminate the demand circuit.
Instructions:	Accept the default, Disable, or select Enable to force the router to terminate the demand circuit.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.24

Parameter:	**Force Dial**
Default:	Disable
Options:	Enable | Disable
Function:	When set to Enable, this parameter immediately forces the connection to come up.
Instructions:	To force the connection of a demand circuit, select Enable, then reset it to Disable.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.9

Parameter: **Inactivity Time**

Default: 60 seconds

Range: 1 to 99999999 seconds

Function: Measures the data inactivity on the line. Specifically, it determines the number of seconds that can elapse *without* data activity before the router disconnects the line. Each time data passes through the router, the Inactivity Time resets.

Note: The router does not consider LQR, LCP, and periodic CHAP messages as data, so they do not reset the timer.

This timer works with the Inactivity Mode parameter to determine how inactivity is monitored. Once the router concludes that there is no data activity, it disconnects the line.

Instructions: Specify a time limit, between 1 and 99999999 seconds, that the router waits before bringing the switched connection down.

If you want the dial line to remain up at all times, enter 99999999. The connection remains up unless the network brings down the connection. If the connection is brought down, the router redials the same number when the next packet is ready for transmission. You can also manually force the router to establish a call if a line is available.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.15

Parameter: **Retry Max**

Default: 2

Range: 1 to 10

Function: Specifies the number of attempts that the router makes to establish the circuit. The router tries all of the phone numbers in the outgoing phone list for a given line. If no connection is made, and there is still data to send, the router increments the retry count, then retries these numbers on the next line in the pool.

Instructions: Enter the number of times you want the router to try to establish the circuit.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.25

Parameter:	**Retry Delay**
Default:	3 seconds
Range:	1 to 10 seconds
Function:	Determines how long the router waits between each retry attempt before trying to re-establish the circuit.
Instructions:	Enter the amount of time that you want the router to wait before trying the next line in the pool. The amount of time you choose depends on the time it typically takes the network to recover.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.27

Parameter:	**Connection Mode**
Default:	Collision Master
Options:	No Dial | Collision Master | Collision Slave
Function:	Determines the role of a router when two routers try to establish a demand circuit with each other. Both routers in a demand configuration can initiate a call. This parameter determines which router places the call first, to prevent both routers from placing the call at the same time.
Instructions:	To avoid continual collisions, configure one router as Collision Master and the other as Collision Slave. To ensure that a router receives calls, but never initiates calls, enter No Dial. Calls are then made only in one direction. If this circuit is part of an unnumbered demand circuit group, the router automatically sets this parameter to No Dial because a circuit in a demand circuit group cannot initiate a call. Select Collision Master or Collision Slave if you are configuring a bandwidth pool for this circuit and the router is congestion monitor.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.28

Parameter:	**Auto Demand Termination**
Default:	Disabled
Options:	Enabled | Disabled
Function:	For applications where there are two paths to the same destination, this parameter allows the router to automatically terminate a failed demand circuit and send the data over an alternate path to the destination. Note that the router does not terminate the circuit until it reaches the maximum connection attempts, which you specify in the Retry Max parameter. Enable this parameter when the router continues to advertise a static route over a demand circuit, but the router cannot establish a connection over that circuit. The router terminates the demand circuit, which notifies the routing protocol that the static routes associated with this circuit are no longer active. The router then uses the alternate path.
Instructions:	Select Enable if you have an alternate path to a remote destination and you want to ensure that if the demand circuit fails, the router terminates the circuit and sends data over the alternate path to the destination.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.29

Parameter:	**Auto Demand Term. Reset**
Default:	60 minutes
Range:	1 to 999999 minutes
Function:	Specifies the amount of time in minutes, that the router waits before re-establishing the demand circuit after an auto demand termination. Once the router re-establishes the demand circuit, the protocols readvertise the static routes for this demand circuit.
Instructions:	Specify an amount of time that allows the network to recover or that allows your Network Administrator to resolve the problem. You must enter a value for this parameter if you configured the Auto Demand Termination parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.30

Parameter:	**CHAP Local Name**
Default:	None
Options:	Any text string; maximum 20 characters
Function:	This name is part of the outbound call and it informs remote peer routers of the local router's identity.
Instructions:	If you configure CHAP as the authentication protocol, specify a name for router identification. If not, ignore this parameter. Do not configure this parameter for a demand circuit group.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.31

Parameter:	**CHAP Secret**
Default:	Unsecured
Options:	Any text string; maximum 20 characters
Function:	Specifies the CHAP Secret you assign to this interface. The CHAP Secret is for identification and security purposes, and it must be the same on both sides of the link. When one router places a call to another router, an authentication process takes place. During this phase, the routers send challenge packets back and forth that include the CHAP Secret. Both routers on a link must have the same secret to correctly calculate responses to the challenges.
Instructions:	If you configure CHAP as the authentication protocol, specify the CHAP Secret. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.32

Parameter:	**PAP Local ID**
Default:	None
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP ID that you assign to this interface. It identifies the calling router to the called router. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP ID or the called router sends an Authenticate Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection.
Instructions:	If you are using PAP as the authentication protocol, specify a unique PAP ID for this circuit. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.37

Parameter:	**PAP Password**
Default:	Unsecured
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP password that you assign to this interface. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP password or the called router sends an Authenticate Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection.
Instructions:	If you are using PAP as the authentication protocol, specify a unique PAP password for this circuit. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.38

Parameter:	**Maximum Up Time**
Default:	60 minutes
Range:	1 to 999999 minutes
Function:	Specifies the maximum duration of a call for a continuous period of time. By configuring this parameter, you ensure that the connection is not up longer than necessary. For example, you may configure the circuit's availability (via the Start and End time parameters) from 9:00 a.m. to 5:00 p.m. Then configure this parameter for 60 minutes. If the connection comes up at 10:00 a.m., the router keeps the circuit active until 11:00 a.m. Then the router invokes the Max UpTime Termination parameter to deactivate the circuit.
Instructions:	Enter the maximum amount of time the call can last for a continuous time period.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.10

Parameter:	**Max UpTime Termination**
Default:	Disabled
Options:	Enabled | Disabled
Function:	Automatically brings down the circuit if the call reaches the maximum time that you specify in the Maximum Up Time parameter. If the router receives data after the circuit is down, the router does not establish a demand connection.
Instructions:	Enter Enable if you want the circuit to terminate upon reaching the maximum time limit for the call.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.33

Parameter:	**UpTime Term. Reset**
Default:	60 minutes
Range:	1 to 999999 minutes
Function:	Determines the amount of time the router waits before making the demand circuit available again after an uptime termination (Max UpTime Termination parameter). The circuit is not established at this point, but the next time the router receives data, the circuit is now available and the router can activate it. The router invokes this timer only after an invoking the UpTime Termination function.
Instructions:	Enter the time period before the router waits before making the circuit available again. You must enter a value for this parameter if you configured the Max UpTime Termination parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.34

Parameter:	**Circuit Name**
Default:	None
Options:	Any valid demand circuit name
Function:	Identifies the name of the demand circuit.
Instructions:	Site Manager fills in this name based on the available circuit names. To modify this parameter, enter a new name to modify and click on Apply.
MIB Object ID:	1.3.6.1.4.1.18.3.3.2.3.1.3

Parameter:	**Minimum Call Duration**
Default:	60 seconds
Options:	10 to 2,147,483,647
Function:	Specifies the minimum amount of time that the connection remains active regardless of whether there is data traffic.
Instructions:	Enter the minimum amount of time the connection should remain active. For dial optimized routing circuits, this timer should be set long enough to send all routing updates to the remote nodes in the network.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.45

Parameter: **Inactivity Mode**

Default: Both Directions

Options: Both Directions │ Transmit Only │ Receive Only │ Either Direction

Function: Measures data inactivity for a specific direction across a line. Specifically, it lets you decide in which direction the router determines inactivity. Together with the Inactivity Time parameter, this parameter informs the router to deactivate the connection down if there is no data in the specified direction.

Note: The router does not consider PPP's LQR, LCP, and periodic CHAP messages as data, so the router does not consider them when determining inactivity.

Instructions: Select the option that best suits your application.

Option	Meaning
Both Directions	If the router does not receive data and does not transmit data, it terminates the connection. The inactivity has to be in both directions.
Transmit Only	If there is no data to transmit, the router terminates the connection. The router disregards data it receives.
Receive Only	If the router does not receive data, it terminates the connection. The router disregards data it transmits.
Either Direction	If the router does not receive or transmit data, it terminates the connection. The inactivity can be in either direction.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.5.1.46

Parameter:	**Dial Optimized Routing**
Default:	Disabled
Options:	Disabled | Enabled
Function:	Enables dial optimized routing for this interface.
Instructions:	Select Enabled to exchange RIP or RIP/SAP updates only when a connection is active for data transmission or when the protocol makes an update request at the expiration of the Broadcast Timer (IP) or Update Interval (IPX). Routing updates alone cannot initiate connections. Accept the default if you do not want to limit updates in this way. If you do not enable dial optimized routing, you may want to limit routing updates using another method. Refer to Chapter 4 for more information about limiting broadcast traffic.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.47

Parameter:	**Outbound Authentication**
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether the router performs authentication when it places an outbound call. Disabling outbound authentication improves interoperability with devices that may not allow two-way authentication or may not support CHAP.
Instructions:	Accept the default, Enable, if you want to use two-way authentication, that is, both sides of the connection will authenticate the other's identity. Select Disable to use one-way authentication, which means that only the router receiving the call performs authentication.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.48

Adding Bandwidth for Dial-on-Demand Lines

If the demand line becomes congested, the router can provide an additional 29 dial-up lines to reduce the congestion. To do this, you associate a configured bandwidth-on-demand pool with the demand circuit.

To add additional lines to support the demand line:

1. **Click on BW on Demand in the Demand Circuits window (refer to Figure 8-2).**

   Site Manager displays the Enter a BOD Pool window (Figure 8-4).

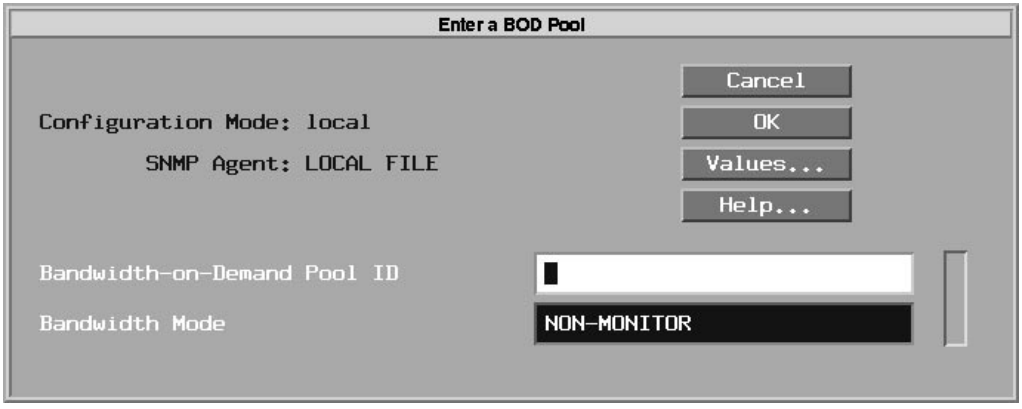


Figure 8-4. Enter a BOD Pool Window

2. **Enter an ID number of an existing bandwidth-on-demand pool.**
3. **Click on OK.**

   Site Manager displays the BOD Configuration window (Figure 8-5). This window contains the monitor options for the initial demand line. They determine whether the router monitors the congestion over the demand line and when the router should bring up additional lines from the bandwidth pool to relieve congestion.

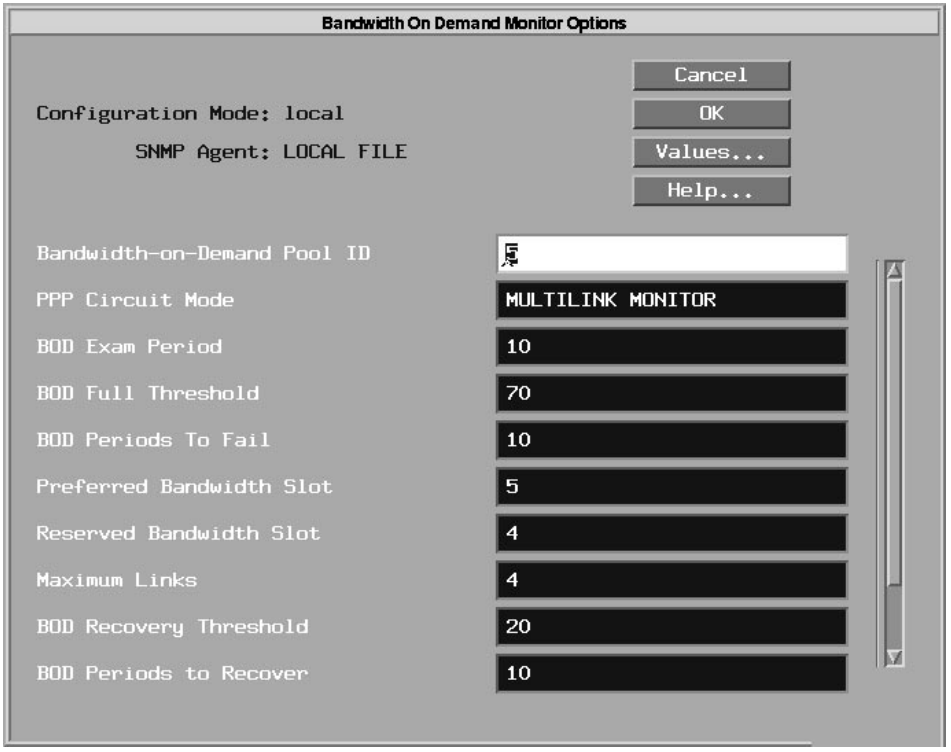


Figure 8-5. BOD Configuration Window

4. **Enter values for these parameters according to the congestion monitor parameter descriptions in Chapter 10.**
5. **Click on OK to save your changes.**

   Site Manager returns to the Demand Circuits window.
6. **Click on Remove BOD to remove bandwidth-on-demand service for the demand circuit.**
7. **Click on Done to return to the Configuration Manager.**

Enabling Protocols for Demand Circuits

To enable a protocol or protocols for a selected demand circuit

1. **Select Protocols > Add/Delete at the top-left corner of the Demand Circuits window (refer to Figure 8-3 on page 8-3).**

   Site Manager displays the Select Protocols window (Figure 8-6).

Figure 8-6. Select Protocols Window

2. **Select one or more protocols for this demand circuit, then click on OK.**

   For each protocol you select, the Configuration Manager displays a protocol-specific window that prompts for required information. If you need assistance in responding to any queries, consult the appropriate protocol manual.

   When you complete the protocol selection, Site Manager returns you to the Demand Circuits window (refer to Figure 8-3).

3. **Click on Done until you return to the Configuration Manager window.**

Note: You may not configure protocol prioritization for demand circuits running PPP multilink. Protocol prioritization modifies the order in which packets go across the line. This could change the multilink-assigned order of packets and lead to problems with the data.

Scheduling When the Demand Circuit Is Available

Once you finalize the circuit's configuration, you can specify the time period that the circuit is available. To do this

1. **From the Demand Circuits window, click on Schedule.**

   Site Manager displays the Circuit Time of Day Schedule window (Figure 8-7).

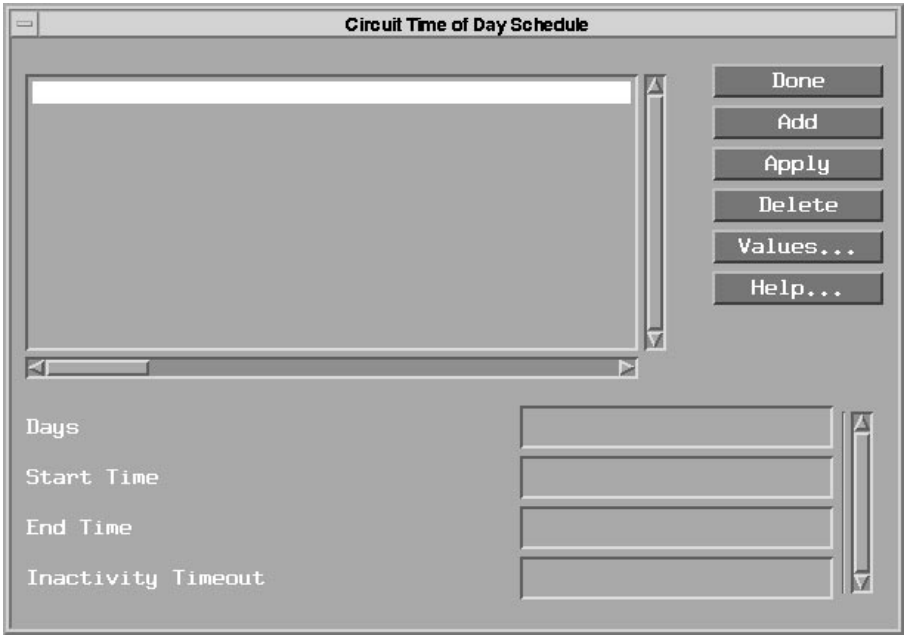


Figure 8-7. Circuit Time of Day Schedule Window

2. **Click on Add. Site Manager displays the Circuit Time of Day Schedule window where you make your entry(Figure 8-8).**

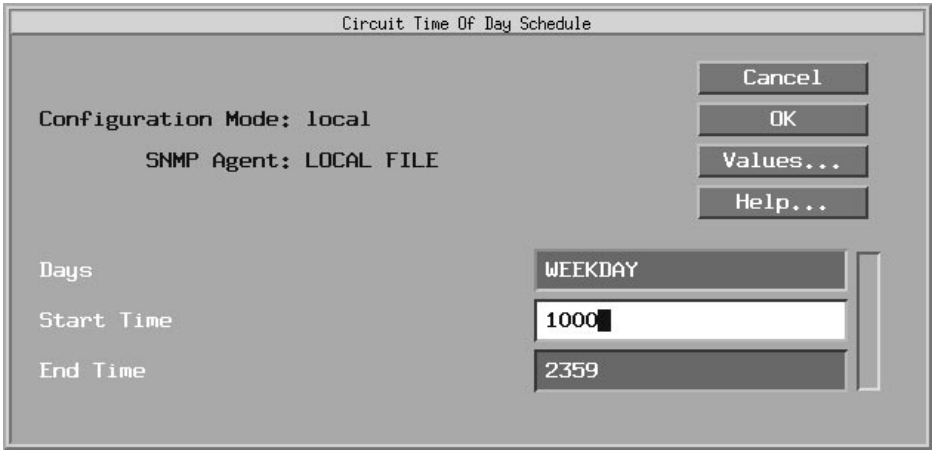


Figure 8-8. Circuit Time of Day Schedule Window

3. **Fill in the schedule, referring to the parameter descriptions on page 8-20.**
4. **Click on OK after you specify a time interval.**

   Site Manager returns to the Circuit Time of Day Schedule (Figure 8-9) with a schedule entry displayed for the circuit.
5. **Click on Done.**

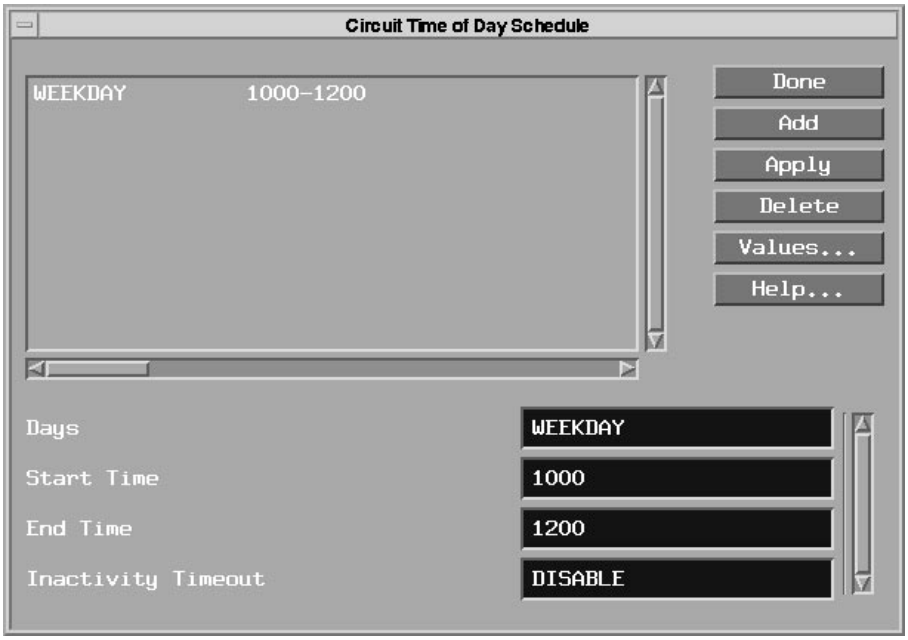


Figure 8-9. Completed Circuit Time of Day Schedule Window

Schedule Parameters

Use the following descriptions as guidelines when you configure the parameters in the Circuit Time of Day Schedule window.

Parameter:	**Days**
Default:	Weekday
Options:	Monday through Sunday | Weekday | Weekend
Function:	Specifies the days that this circuit should be available.
Instructions:	Enter a specific day of the week; enter Weekday for the weekdays; or enter Weekend for the whole weekend.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.4

Parameter:	**Start Time**
Default:	0
Range:	0 to 2359
Function:	Specifies the time of day the circuit is available. The router uses this value along with the End Time parameter to establish a time interval that the circuit is available. This parameter also specifies the time of day any secondary lines are available if you have configured a bandwidth-on-demand pool for this demand circuit.
Instructions:	Enter an hour of the day, using the 24-hour-system of expressing time. For example, to activate the circuit at 5:00 p.m., enter 1700.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.5

Parameter:	**End Time**
Default:	2359
Range:	0 to 2359
Function:	Specifies the time of day when the circuit is no longer available. The router uses this value along with the Start Time parameter to establish a time interval that the circuit is available. This parameter also specifies the time of day all secondary lines are brought down if you have configured a bandwidth-on-demand pool for this demand circuit.
Instructions:	Enter an hour of the day, using the 24-hour-system of expressing time. For example, to deactivate the circuit at 10:00 p.m., enter 2200.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.6

Parameter:	**Inactivity Timeout**
Default:	Disable
Options:	Enable | Disable
Function:	Determines whether the router uses the Inactivity Time parameter to control circuit activity during the configured start and end time. The Inactivity Time parameter defines the number of seconds that can elapse without data going across the line before the router disconnects the call.
Instructions:	Enter Enable if you want the router to use the Inactivity Time parameter together with the Start Time and End Time parameters. If there is no data going across the line, then the Inactivity Time parameter informs the router to disconnect the call. Enter Disable if you want the router to establish the connection at the start time and remain up until the configured end time regardless of data activity. In this case, only the network can bring down the connection.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.7

Deleting Demand Circuits

To delete a demand circuit, follow these steps.

1. **Select Dialup > Demand Circuits.**

   Site Manager displays the Demand Circuit window (refer to Figure 8-10).

2. **Click on Delete.**

   Site Manager removes the circuit.

3. **Click on Done until you return to the Configuration Manager window.**

Configuring Demand Circuit Groups

To simplify configuration of unnumbered interfaces in a large network, configure a demand circuit group according to the following instructions.

1. **Select Dialup > Demand Circuit Groups from the Configuration Manager window.**

   Site Manager displays the Demand Circuit Groups window (Figure 8-10).

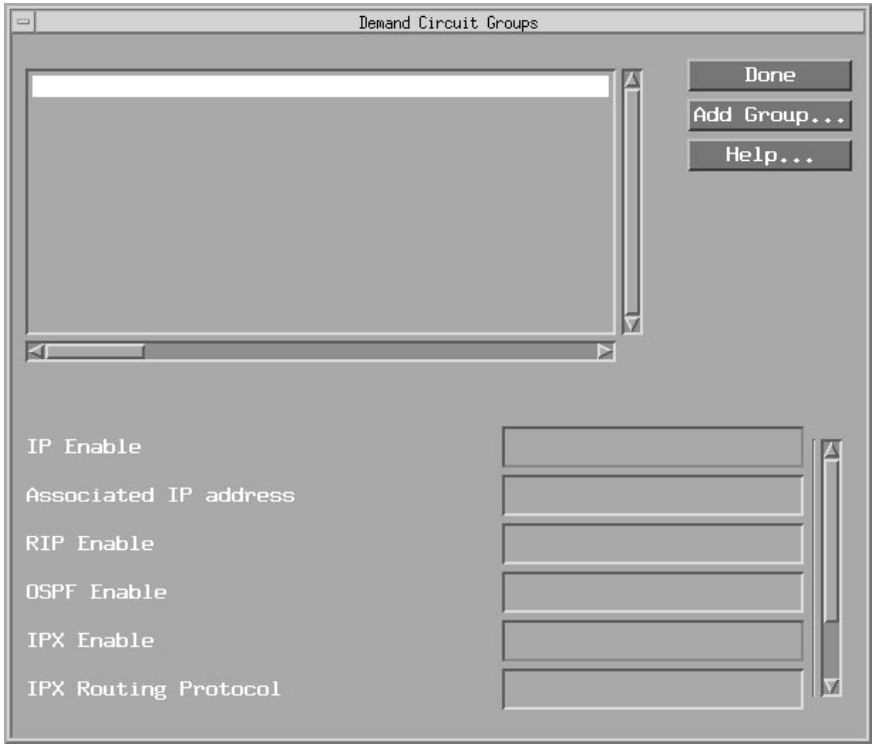


Figure 8-10. Demand Circuit Groups Window

2. **Click on Add Group.**

   Site Manager displays the Enter a Demand Pool window (Figure 8-11).

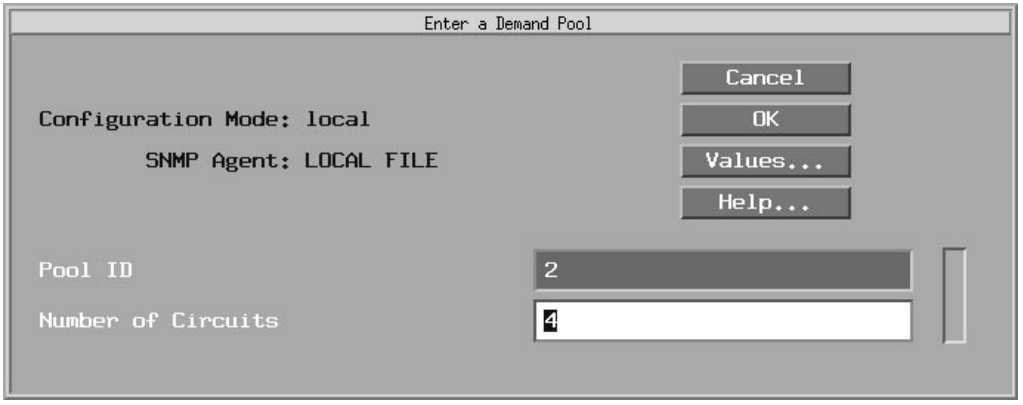


Figure 8-11. Enter a Demand Pool Window

3. **Enter values for these fields according to the parameter descriptions that follow this procedure.**
4. **Click on OK to save.**

Demand Pool Window Parameter Descriptions

Use the following descriptions as guidelines when you configure the parameters in the Demand Pool window.

Parameter:	**Pool ID**
Default:	None
Options:	1 to 255
Function:	Identifies a demand pool that you want the demand circuit group to use.
Instructions:	Enter an ID number of an existing demand pool.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.6

Parameter:	**Number of Circuits**
Default:	None
Options:	Maximum number of lines in the line pool
Function:	Indicates how many unnumbered circuits are in the demand circuit group from the selected pool.
Instructions:	Enter a number that is less than or equal to the number of lines in the demand pool associated with this circuit group.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.4

Configuring the Caller Resolution Information

Once you fill in the demand pool ID and number of circuits, Site Manager displays the Caller Resolution Info window (Figure 8-12). This window enables you to enter the CHAP Name or PAP ID of the remote routers that this circuit group supports.

Site Manager prompts you for this information here because demand circuit groups cannot initiate calls. By displaying this window, Site Manager ensures that you make an entry for the remote router in the caller resolution table so that the local router, configured with the demand circuit group, accepts incoming calls.

Figure 8-12. Caller Resolution Info Window

Fill out the Caller Resolution Info Window as follows:

1. **Enter values for the parameters according to the descriptions that follow.**
2. **Click on OK when you are finished.**

You can specify additional caller names for a demand circuit group by selecting Dialup > Caller Resolution Table, and entering the values for the Caller Name and the Local Group parameters.

Caller Resolution Info Parameters

Use the following descriptions as guidelines when you configure the parameters in the Caller Resolution Info window.

Parameter:	**Caller Name**
Default:	None
Options:	Any text string; maximum 20 characters
Function:	This name is part of the incoming call and it informs the local router of the remote router's identity.
Instructions:	Enter a text string no longer than 20 characters that identifies a remote router. If you configure CHAP as the authentication protocol, you must enter a CHAP name for this parameter. If you configure PAP as the authentication protocol, you must enter a PAP ID for this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.2

Parameter:	**CHAP Secret**
Default:	Unsecured
Options:	Any text string; maximum 20 characters
Function:	Specifies the CHAP Secret you assign to this interface. The CHAP Secret is for identification and security purposes, and it must be the same on both sides of the connection. When one router places a call to another router, an authentication process takes place. During this phase, the routers send challenge packets back and forth that include the CHAP Secret. Both routers on a link must have the same secret to correctly calculate responses to the challenges.
Instructions:	If you configure CHAP as the authentication protocol, specify the CHAP Secret. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.4

Parameter:	**PAP Password**
Default:	None
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP password you assign to this interface. The PAP password is for identification and security purposes, and it must be the same on both sides of the connection. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct password. If the password is not correct, the called router sends an Authenticate Negative Acknowledgment (Authenticate-NAK) message and the router does not bring up the connection.
Instructions:	If you configured PAP as the authentication protocol, specify a unique PAP password. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.5

Enabling Protocols for Circuit Groups

Once you configure a demand circuit group, Site Manager redisplays the Demand Circuit Groups window showing the new demand circuit group and its associated demand pool (Figure 8-13).

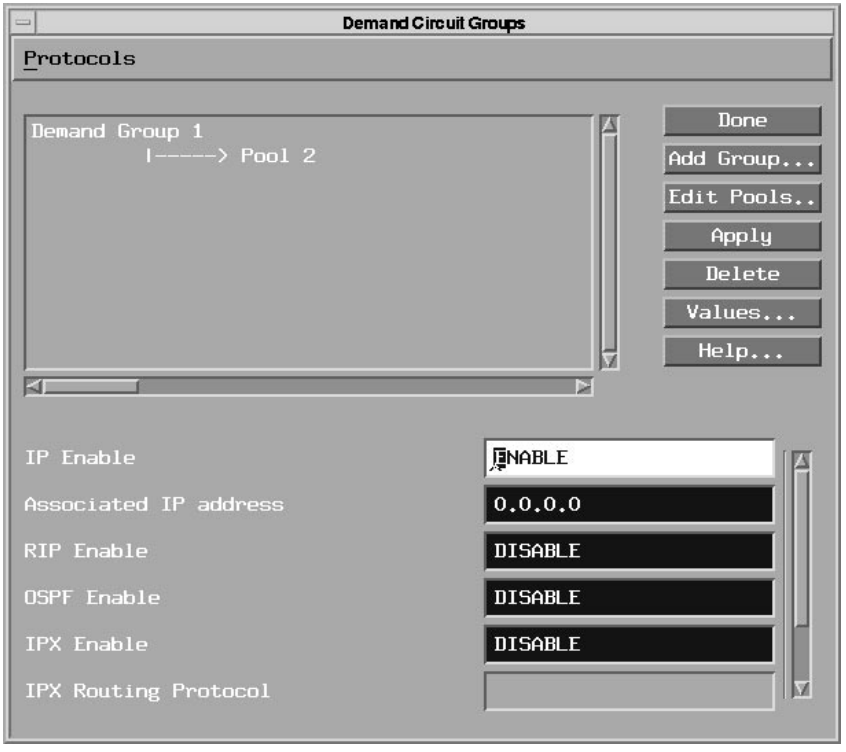


Figure 8-13. Configured Demand Circuit Groups Window

From the Demand Circuit Groups window, you can now enable the unnumbered protocols for the circuits.

1. **Enable the appropriate unnumbered protocols.**

   Refer to the parameter descriptions that follow these procedures.

2. **Click on Done when you are finished configuring circuit groups.**

To modify your circuit group configuration:

1. **Click on Add Group to add other circuit groups, then click on Apply.**
2. **Click on Edit Pools to edit the number of circuits in a group.**

   In addition, from the Edit Pools window, you can click on Add to add more demand pools.
3. **Click on Delete to delete a circuit group.**
4. **Click on Done when you are finished configuring circuit groups.**

Circuit Group Protocol Parameters

Use the following descriptions as guidelines when you configure the parameters in the Demand Circuit Groups window.

Parameter:	**IP Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables IP on this interface.
Instructions:	Select Enable to enable IP support on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.5

Parameter:	**Associated IP address**
Default:	None
Options:	Any valid IP address
Function:	Specifies an address that IP uses when sending out a packet. All circuits in the demand circuit group use this address. This address is another interface on the router for which you configured the unnumbered interface. IP routing protocols use this address to advertise the local node to remote nodes over the unnumbered interface. For more information about associated IP addresses, refer to *Configuring IP Services*.
Instructions:	Enter the address of any numbered interface on the router. If you are running RIP over the unnumbered interface and if you are using a subnet address as the associated address, the local and remote associated addresses should have the same network number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.6

Parameter:	**RIP Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables RIP on this interface.
Instructions:	Select Enable to enable RIP support on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.7

Parameter:	**OSPF Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables OSPF on this interface.
Instructions:	Select Enable to enable OSPF support on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.8

Parameter:	**IPX Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables IPX on this interface.
Instructions:	Select Enable to enable IPX support on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.9

Parameter:	**IPX Routing Protocol**
Default:	RIP/SAP
Options:	RIP/SAP
Function:	Specifies an IPX routing protocol on the IPX interface.
Instructions:	Select a routing protocol for this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.12

Parameter:	**IPXWAN Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables IPXWAN on this interface.
Instructions:	Select Enable to enable IPXWAN on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.13

Parameter:	**Bridge Enable**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables bridging on this interface.
Instructions:	Select Enable to enable bridging support on this interface.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.12.1.10

Chapter 9
Configuring Backup Circuits

To configure backup service, you designate an existing leased circuit as a primary circuit, and if this circuit fails, the router provides a backup circuit. If you have not configured a leased circuit, the Dialup > Backup Circuits option is grayed out.

Refer to Table 9-1 for the appropriate instructions on configuring backup circuits.

Table 9-1. Dial Backup Options

Primary Circuit Protocol	Backup Circuit Protocol	Instructions to Use
Standard	PPP (async or sync)	Configuring PPP over Backup Circuits on page 9-2
PPP	PPP (async or sync)	Configuring PPP over Backup Circuits on page 9-2
Frame Relay -- backing up only one PVC	PPP (async or sync)	Configuring Frame Relay over Backup Circuits on page 9-13
Frame Relay -- backing up the entire interface	Frame Relay	Configuring Frame Relay over Backup Circuits on page 9-13

Note: You cannot configure a bandwidth-on-demand circuit as a primary circuit.

Configuring PPP over Backup Circuits

To configure PPP over the backup circuit

1. **Select Dialup > Backup Circuits > PPP from the Configuration Manager window (Figure 9-1).**

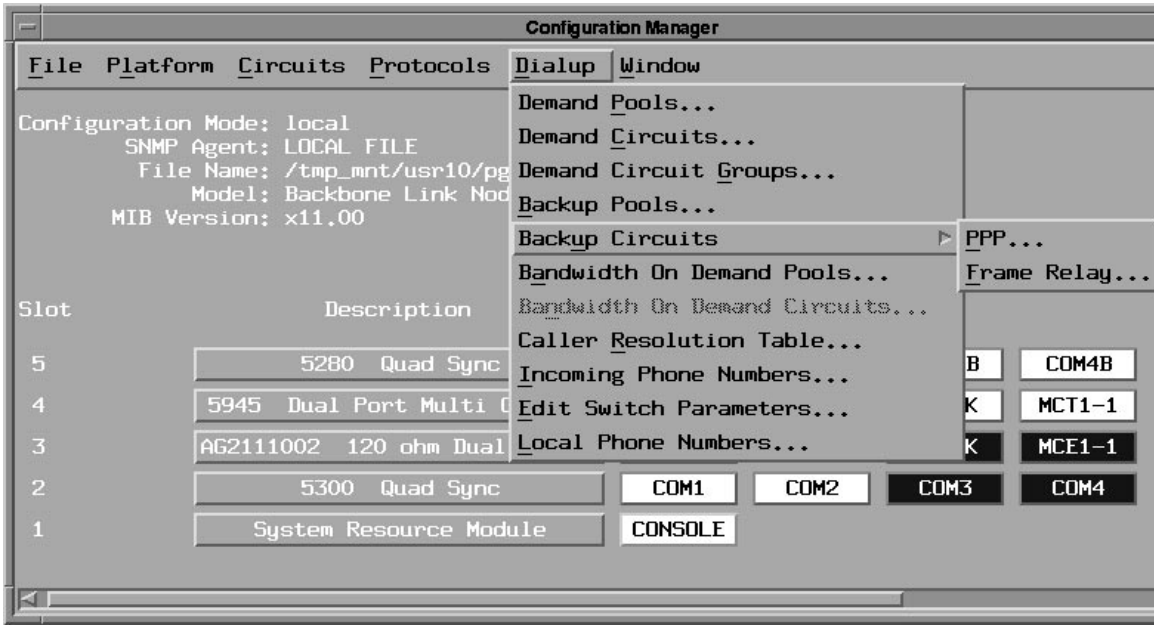


Figure 9-1. Backup Circuits Menu

Site Manager displays the Primary Circuit Definition window (Figure 9-2).

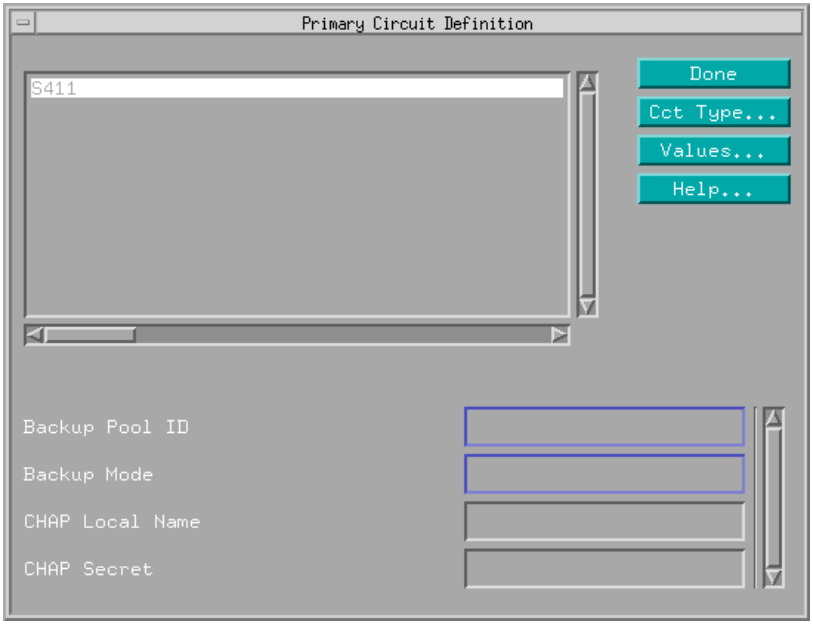


Figure 9-2. Primary Circuit Definition Window

2. **In the Primary Circuit Definition window, highlight a circuit name and click on Cct (Circuit) Type.**

   Site Manager displays the Circuit Options window (Figure 9-3).

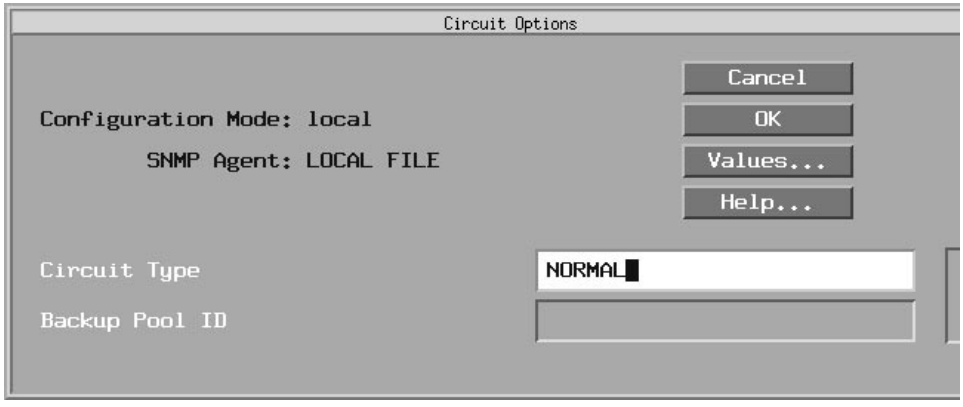


Figure 9-3. Circuit Options Window

3. **Set the Circuit Type parameter to primary, and specify the backup pool that you want associated with this circuit (Figure 9-4).**

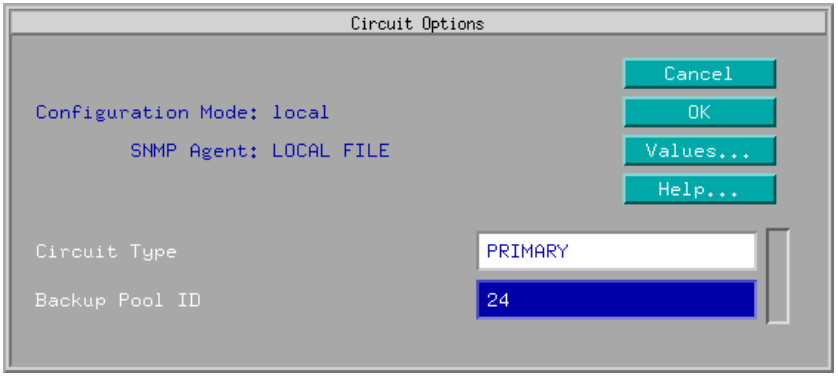


Figure 9-4. Circuit Options Window with Primary Circuit Type

4. **Click on OK.**

   Site Manager displays the Primary Circuit Definition window (Figure 9-5).

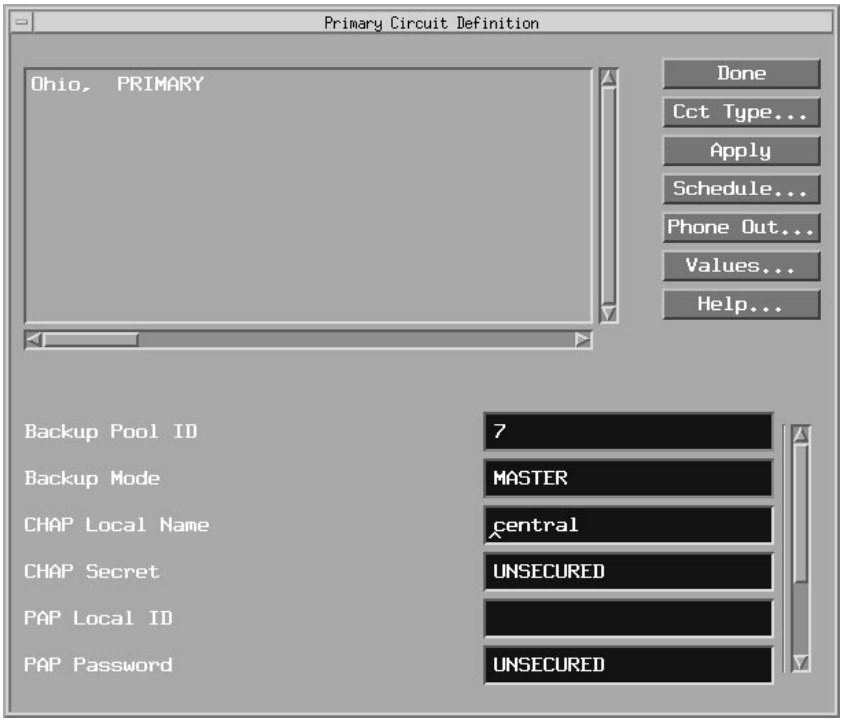


Figure 9-5. Configured Primary Circuit Definition Window

5. **Repeat Steps 2 through 4 to specify more primary circuits.**

   When you configure a primary circuit, Site Manager automatically creates a special PPP record for dial backup service. The circuit uses this generic record to identify who is calling the router.

   This record appears in the PPP Interface Lists screen as follows:

   ```
   Interface for Dialup Lines
   ```

Circuit Options Parameters

Use the following descriptions as guidelines when you configure the circuit options parameters.

Parameter:	**Circuit Type**
Default:	Normal
Options:	Primary | Normal
Function:	Specifies whether or not the circuit over the selected leased line uses the dial backup service. These lines are not part of the backup pool. For a normal, that is, standard leased circuit, the router does not provide a backup if the original circuit fails. For a primary circuit, the router does provide a backup to carry traffic.
Instructions:	Accept the default, Normal, if you do not want a backup circuit for the data going across this line. Select Primary if you want to use the dial backup service.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.1.1.31

Parameter:	**Backup Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the backup pool for the primary circuit.
Instructions:	If you select Primary in the Circuit Type parameter, enter the ID of the backup line pool that this circuit should use. If you select Normal for the Circuit Type parameter, Site Manager does not allow you to enter a backup pool ID. You must create a backup pool before you can specify a circuit as primary. The router first creates the circuit as a normal circuit. See Chapter 7 for instructions on creating a backup pool.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.5

Editing PPP Primary Circuit Definition Parameters

After you designate a primary circuit, Site Manager adds several buttons to the Primary Circuit Definition window (Apply, Schedule, Phone Out) that allow you to edit the circuit.

To edit the primary circuit:

1. **Highlight the desired primary circuit and enter new values for the parameters you want to edit, referring to the following descriptions for guidelines.**
2. **Click on Apply to save your changes.**
3. **Click on Done to return to the Configuration Manager window.**

Selecting CHAP or PAP for the Primary Circuit

CHAP is the default authentication protocol. To select PAP, you must go to the PPP Interface List window, select the special line record for dial lines, and specify PAP in the Local Authentication Protocol parameter. For more information about PPP and configuring authentication protocols, see *Configuring PPP Services*.

PPP Primary Circuit Parameters

Use the following descriptions as guidelines when you configure the primary circuit parameters.

Parameter:	**Backup Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the backup pool for the primary circuit.
Instructions:	Enter the ID number of the backup pool this circuit should use.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.5

Parameter:	**Backup Mode**
Default:	Master
Options:	Master | Slave
Function:	Determines which router site initiates dialing to establish a backup connection if the primary circuit fails.
Instructions:	Accept the default, Master, if you want the router to initiate dialing. The router at the other end must be set to Slave, so it waits until the master router initiates the call. Only one router on the link can serve as the master router. If both are set to Master, they may try to initiate a call simultaneously, resulting in a collision on the network. Note that if you change the Backup Mode parameter from Master to Slave, Site Manager displays the Caller Resolution Info window, prompting you to make a caller resolution table entry for the circuit. By prompting for a table entry, Site Manager ensures that you identify the remote master router so that the local router verifies the master router's identity and accepts incoming calls. Refer to Chapter 12 for parameter descriptions for this window.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.7

Parameter:	**CHAP Local Name**
Default:	None
Options:	Any text string; maximum 20 characters
Function:	This name is part of the outbound call and it informs remote peer routers of the local router's identity.
Instructions:	If you configure CHAP as the authentication protocol, specify a name for router identification. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.31

Parameter:	**CHAP Secret**
Default:	Unsecured
Options:	Any text string; maximum 20 characters
Function:	Specifies the CHAP Secret you assign to this interface. The CHAP Secret is for identification and security purposes, and it must be the same on both sides of the link. When one router places a call to another router, an authentication process takes place. During this phase, the routers send challenge packets back and forth that include the CHAP Secret. Both routers on a link must have the same secret to correctly calculate responses to the challenges.
Instructions:	If you configure CHAP as the authentication protocol, specify the CHAP Secret. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.32

Parameter:	**PAP Local ID**
Default:	None
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP ID that you assign to this interface. It identifies the calling router to the called router. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP ID or the called router sends an Authenticate Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection.
Instructions:	If you are using PAP as the authentication protocol, specify a unique PAP ID for this circuit. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.37

Parameter:	**PAP Password**
Default:	Unsecured
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP password that you assign to this interface. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP password or the called router sends an Authenticate Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection.
Instructions:	If you are using PAP as the authentication protocol, specify a unique PAP password for this circuit. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.38

Parameter:	**Maximum Up Time**
Default:	60 minutes
Range:	1 to 999999 minutes
Function:	Specifies the maximum duration of a call for a continuous period of time. By configuring this parameter, you ensure that the connection is not up longer than necessary. For example, you may configure the circuit's availability (via the Start and End time parameters) from 9:00 a.m. to 5:00 p.m. Then configure this parameter for 60 minutes. If the connection comes up at 10:00 a.m., the router keeps the circuit active until 11:00 a.m. Then the router invokes the Max UpTime Termination parameter to deactivate the circuit.
Instructions:	Enter the maximum amount of time the call can last for a continuous time period.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.10

Parameter:	**Max UpTime Termination**
Default:	Disabled
Options:	Enabled | Disabled
Function:	Automatically brings down the circuit if the call reaches the maximum time that you specify in the Maximum Up Time parameter. If the router receives data after the circuit is down, the router does not establish a backup connection.
Instructions:	Enter Enable if you want the circuit to terminate upon reaching the maximum time limit for the call.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.33

Parameter:	**UpTime Term. Reset**
Default:	60 minutes
Range:	0 to 999999 minutes
Function:	Determines the amount of time the router waits before making the backup circuit available again after an uptime termination (Max UpTime Termination parameter). The circuit is not active at this point, but the next time the router receives data, the circuit is now available and the router can activate it. The router invokes this timer only after invoking the UpTime Termination function.
Instructions:	Enter the time period before the router waits before making the circuit available again. You must enter a value for this parameter if you configured the Max UpTime Termination parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.34

Parameter:	**Outbound Authentication**
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether the router performs authentication when it places an outbound call. Disabling outbound authentication improves interoperability with devices that do not perform two-way authentication or support CHAP.
Instructions:	Accept the default, Enable, if you want to use two-way authentication, that is, both sides of the connection will authenticate the other's identity. Select Disable to use one-way authentication, which means that the authentication process occurs on only one side of the connection.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.48

Configuring Frame Relay over Backup Circuits

For Frame Relay backup circuits, you can use the Frame Relay primary's configuration or a unique configuration.

Remember that when Frame Relay is the protocol for the backup circuit, you are backing up the entire Frame relay interface (link backup). You cannot also use circuit backup (backup of a single PVC) over this same Frame Relay interface.

To designate a circuit as a Frame Relay primary

1. **Select Dialup > Backup Circuits > Frame Relay from the Configuration Manager window.**

   Site Manager displays the Frame Relay Primary Interface Definition window (Figure 9-6).

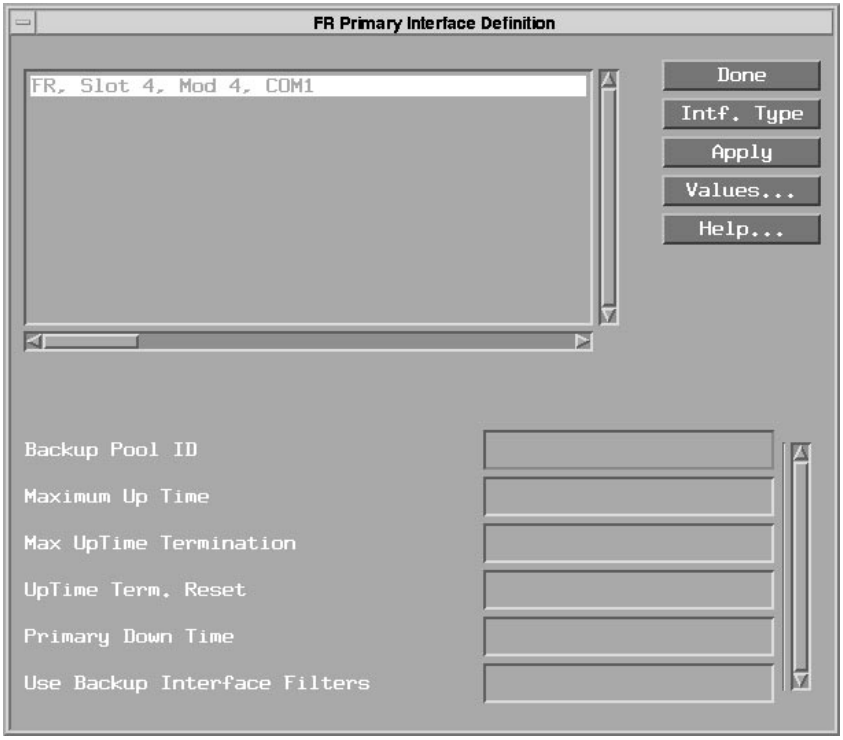


Figure 9-6. Frame Relay Primary Interface Definition

2. **Click on Intf. Type.**

   Site Manager displays the FR Interface window (Figure 9-7).

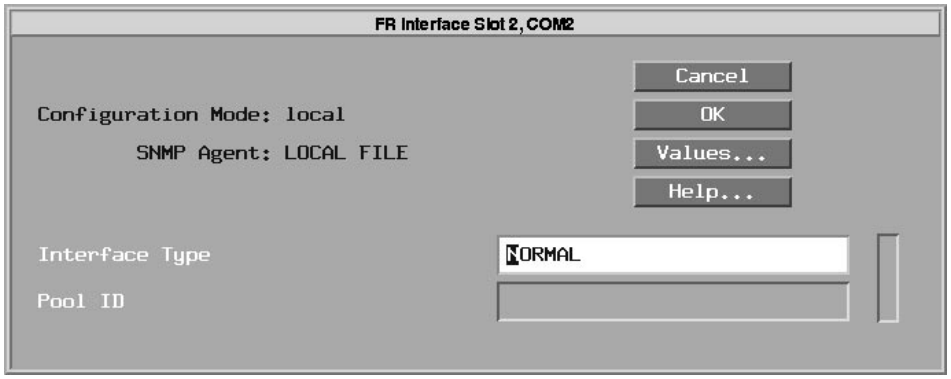


Figure 9-7. FR Interface Window

3. **Select the appropriate value for the interface according to the parameter description that follows this procedure.**

Interface Type Parameter

Use the following descriptions as guidelines when configuring the Frame Relay interface parameters.

Parameter: **Interface Type**

Default: Normal

Options: Normal │ Primary/Shared │ Primary/Secondary

Function: Specifies whether this leased circuit uses dial backup service. For a normal, that is, a leased circuit, the router does not provide a backup circuit if it fails. For a primary circuit, the router will provide a backup.

Instructions: Select one of the following options:

Normal	Indicates that there is no backup service for this circuit.
Primary/Shared	Enables backup service and instructs the router that the backup circuit should inherit the primary circuit's configuration. When you select this option, Site Manager displays a dialog box asking if you want the primary's PVCs duplicated on the backup circuit. Select **Yes** to create a duplicate set of PVCs with the same DLCI numbers as the primary. This is useful if you want the same DLCI numbers going to the same destination. Select **No** to configure unique PVCs for the backup connection. This option is useful if you do not want to back up all the primary's PVCs. By limiting the number of backup PVCs, you can reduce line costs.
Primary/Secondary	Enables backup service and instructs the router that the backup circuit should use its own configuration. It does not adopt the primary's configuration.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.33

Parameter:	**Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the backup pool that the primary circuit uses.
Instructions:	If you selected Primary/Shared or Primary/Secondary as the interface type, enter an existing backup pool for the primary circuit. If you selected Normal as the interface type, Site Manager does not let you enter an ID.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.5

Editing the Frame Relay Primary Circuit

After configuring a primary circuit and interface type, Site Manager returns to the Frame Relay Interface Definition window with the Backup Def., Schedule, Phone Out, and Apply buttons added (Figure 9-8).

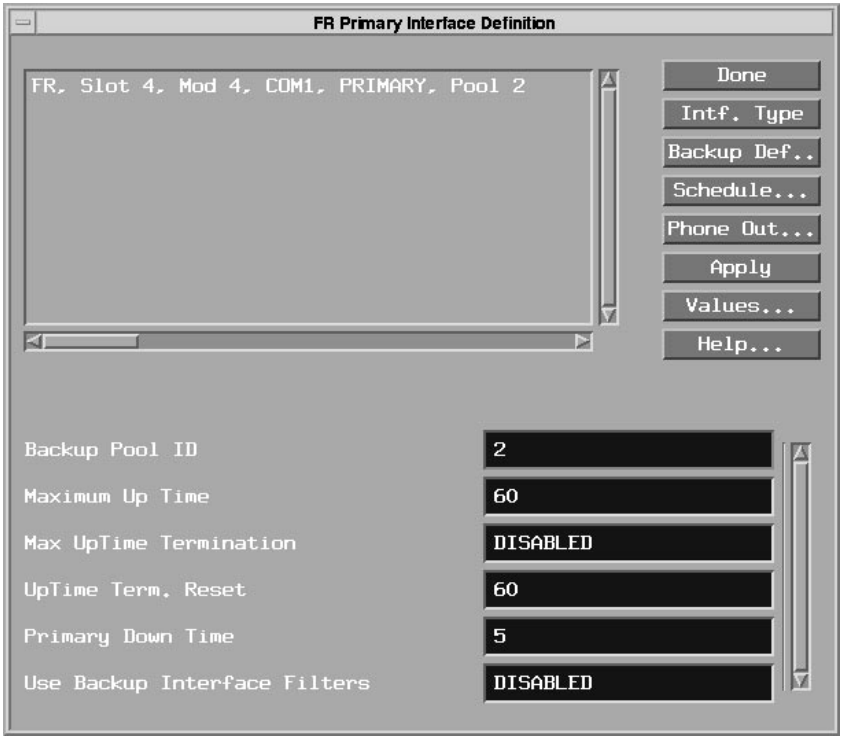


Figure 9-8. Completed Frame Relay Primary Interface

From the Frame Relay Interface Definition window (Figure 9-8), edit the primary and backup circuit's configuration, including service records, PVCs, and filters.

Edit the primary circuit as follows:

1. **Highlight the desired primary circuit and enter new values for the parameters you want to edit. Refer to the following descriptions as guidelines.**
2. **Click on Apply to save your changes.**
3. **Click on Done to return to the Configuration Manager window.**

Frame Relay Primary Circuit Parameters

Use the following descriptions when you edit the primary circuit parameters.

Parameter:	**Backup Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the backup pool for the primary circuit.
Instructions:	Enter the ID number of the backup pool this circuit should use.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.5

Parameter:	**Maximum Up Time**
Default:	60 minutes
Range:	1 to 999999 minutes
Function:	Specifies the maximum duration of a call for a continuous period of time. This value ensures that the connection is not up longer than necessary. For example, you may configure the circuit's availability (via the Start and End time parameters) from 9:00 a.m. to 5:00 p.m. Then configure this parameter for 60 minutes. If the connection comes up at 10:00 a.m., the router keeps the circuit active until 11:00 a.m. Then the router invokes the Max UpTime Termination parameter to deactivate the circuit.
Instructions:	Enter the maximum amount of time the call can last continuously.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.10

Parameter:	**Max UpTime Termination**
Default:	Disabled
Options:	Enabled | Disabled
Function:	Automatically brings down the circuit if the call reaches the maximum time that you specify in the Maximum Up Time parameter. If the router receives data after the circuit is down, the router does not establish a backup connection.
Instructions:	Enter Enable if you want the circuit to terminate upon reaching the maximum time limit for the call.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.33

Parameter:	**UpTime Term. Reset**
Default:	60 minutes
Range:	0 to 999999 minutes
Function:	Determines the amount of time the router waits before making the backup circuit available again after an uptime termination (Max UpTime Termination parameter). The circuit is not active at this point, but the next time the router receives data, the circuit is now available and the router can activate it. The router invokes this timer only after invoking the UpTime Termination function.
Instructions:	Enter the time period before the router waits before making the circuit available again. You must enter a value for this parameter if you configured the Max UpTime Termination parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.34

Parameter:	**Primary Down Time**
Default:	5 minutes
Range:	1 to 999999 minutes
Function:	Specifies the amount of time the router waits before activating a backup connection that initially failed. This parameter works on a slot-by-slot basis. While the router waits for the first connection, a backup connection on another slot can come up, in which case, the router resets this timer on all other slots.
Instructions:	Enter the amount of time the router should wait before activating the backup.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.17

Parameter:	**Use Backup Interface Filters**
Default:	Disabled
Options:	Enabled | Disabled
Function:	Enables the routers to use filters added to the backup. This parameter is configurable only if the interface type is Primary/Shared.
Instructions:	Select Enable to use filters. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.34

Editing the Frame Relay Backup Configuration

To further modify the shared configuration, follow these steps.

1. **Click on Backup Def. from the FR Primary Interface Definition window.**

   Site Manager displays the FR Backup Interface window (Figure 9-9).

Note: The window in Figure 9-9 is for only Primary/Shared interface type. The window for the Primary/Secondary type is similar with the exception of the Filters button. For secondary configurations, you set priorities for the service record, which accomplishes the same task as adding filters.

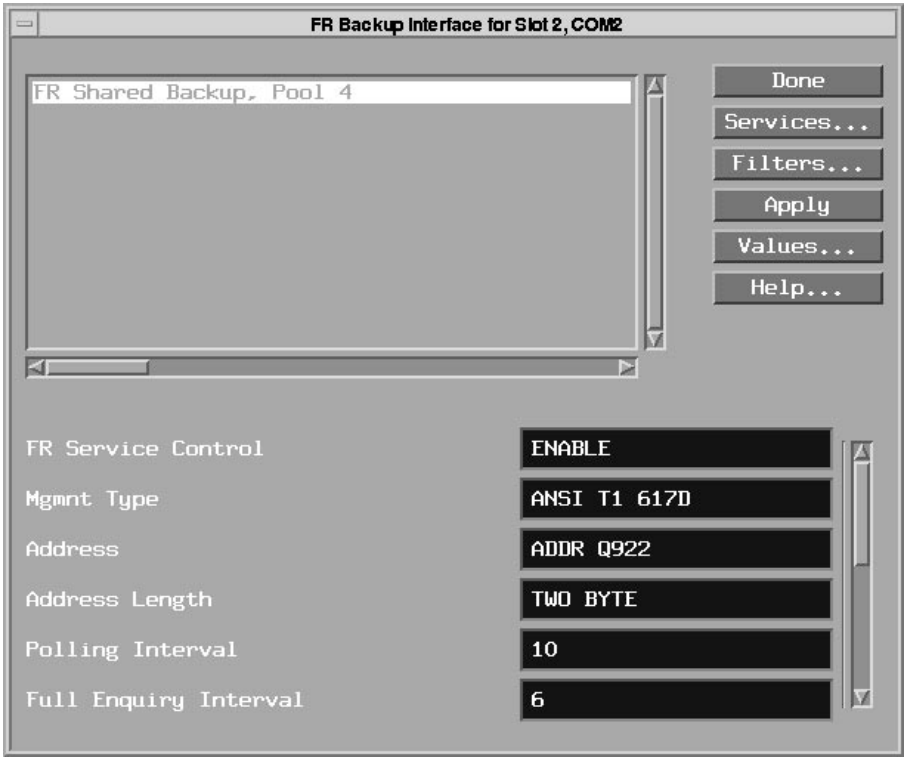


Figure 9-9. FR Backup Interface Window for Primary/Shared Interfaces

2. **Accept the defaults or modify the parameters according to the parameter descriptions that follow this procedure.**

FR Backup Interface Parameters

Use the following descriptions as guidelines when you configure the backup interface parameters.

Parameter: **FR Service Control**

Default: Enable (for Primary/Shared interface types) │ Disable (for Primary/Secondary interface types)

Options: Enable | Disable

Function: Enables the Frame Relay interface.

For secondary interfaces, select Enable to activate the interface once the configuration is complete. Otherwise, accept the default.

For shared interfaces, select Disable to deactivate the Frame Relay interface. Otherwise, accept the default.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.2

Parameter: **Mgmnt Type**

Default: ANSI T1.617D

Options: DLCMI None │ Rev 1 LMI │ ANSI T1.617D │ CCITT Annex A │ LMI Switch │ Annex D Switch │ Annex A Switch

Function: Specifies the management protocol that the router and the Frame Relay network use to communicate status information. Routers connected back to back also use a management protocol to exchange status information.

DLCMI None provides no management interface between the router and the Frame Relay network. In the absence of management support, you must configure all PVCs manually.

Rev 1 LMI provides user-side management services as specified by Revision 1 of the Local Management Interface standard.

ANSI T1.617D provides user-side management services as specified in Annex D to ANSI standard T1.617-1991.

CCITT Annex A provides user-side management services as specified by the ITU-T (formerly CCITT).

LMI Switch offers limited management services for the DCE side of the connection as specified by Revision 1 of the Local Management Interface Standard.

Annex D Switch provides limited management services for the DCE side of the connection as specified in Annex D to ANSI standard T1.617-1991.

Annex A Switch provides limited management services for the DCE side of the connection as specified by the ITU-T.

Instructions: Select the management protocol for the Frame Relay network. The LMI Switch, Annex D Switch, and Annex A Switch options are primarily for troubleshooting.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.6

Parameter: Address

Default: ADDR Q922

Options: ADDR Q922 | ADDR Q922 November 90 | ADDR Q922 MARCH 90 | ADDR Q921

Function: Specifies the DLCI addressing type.

ADDR Q922 selects addressing as specified in the final version of the Q.922 standard. Q.922 provides for FECN, BECN, DE, and EA bits. While most Q.922 addresses are included within a 2-octet field, the standard allows for 3- and 4-octet address fields.

The November draft of ADDR Q922 differs from ADDR Q922 in dropping the D/C bit from the extended (3- and 4-byte) forms.

The March draft of ADDR Q922 differs from ADDR Q922 in defining an 11-bit DLCI and dropping the DE bit from the second octet of the address field.

ADDR Q921 differs from ADDR Q922 MARCH 90 in that it does not use FECNs or BECNs.

Instructions: Select the addressing type for the Frame Relay interface.

MIB Object ID: 1.3.6.1.4.1.18.3.5.9.9.1.1.8

Parameter:	**Address Length**
Default:	Two Byte
Options:	Two Byte | Three Byte | Four Byte
Function:	Specifies the length of the Frame Relay address field.
Instructions:	Select the address length for the address field. This must match what the network specifies.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.9

Note: The length of this field determines the range of valid numbers for the DLCI number set in the Frame Relay PVC List window. See the DLCI Number parameter description for more details.

Parameter:	**Polling Interval**
Default:	10 seconds
Range:	5 to 30 seconds
Function:	Specifies the interval between Status Inquiry messages that the router transmits. Status Inquiry messages cause a network response in the form of a Link Integrity Verification message or Full Status message. Successful completion of the request/response “handshake” verifies the status of the router/Frame Relay network link.
Instructions:	We recommend that you accept the default value, 10 seconds. If the default value does not match what the network requests, enter a value that is appropriate for your network in the range of 5 to 30 seconds. Polling Interval does not function if you set the Mgmnt Type parameter to DLCMI None.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.10

Parameter:	**Full Enquiry Interval**
Default:	6
Range:	1 to 255 polling intervals
Function:	Specifies the interval between Full Status Inquiry messages that the router transmits. Full Status Inquiry messages cause the network to send a Full Status Report message, which lists all PVCs, the PVC status (active or inactive), and whether the PVC is new or previously established. This parameter works with the Polling Interval parameter. The default value, 6, tells the router to send a Full Status Inquiry every 6 polling intervals. For example, with a Polling Interval of 10 and a Full Enquiry Interval of 6, the router transmits a Full Status Inquiry every 60 seconds; with a Polling Interval of 20 and a Full Enquiry Interval of 30, the router transmits a Full Status Inquiry every 10 minutes (600 seconds).
Instructions:	Enter a value between 1 and 255, according to what the network dictates. Full Enquiry Interval does not function if you set the Mgmnt Type parameter to DLCMI None.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.11

Parameter:	**Error Threshold**
Default:	3
Range:	0 to 2,147,483,647
Function:	Together with the value of the Monitored Events parameter, establishes a criterion used to evaluate the quality of the router/Frame Relay network connection. The Error Threshold parameter determines the number of faulty status messages required to bring the connection down. The Monitored Events parameter specifies the number of status message exchanges. If you accept the default values for both Error Threshold and Monitored Events, three status exchange errors in a sequence of four attempted exchanges will bring the connection down. With Error Threshold set to 5 and Monitored Events set to 10, five status exchange errors in a continuous sequence of ten attempted exchanges will bring the connection down. After the network clears the connection, status exchanges continue, and the router monitors line integrity. When the number of consecutive, successful status exchanges is equal to the Error Threshold value, the router restores the Frame Relay connection.
Instructions:	Enter the number of faulty status exchanges that will bring the connection down.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.12

Note: Error Threshold and Monitored Events are nonfunctional if you set Mgmnt Type to DLCMI None.

Parameter:	**Monitored Events**
Default:	4
Range:	0 to 2,147,483,647
Function:	Together with the value of the Error Threshold parameter, establishes a criterion used to evaluate the quality of the router/Frame Relay network connection. Refer to the description of the Error Threshold parameter for more information.
Instructions:	Enter the number of consecutive status exchanges you want the router to monitor.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.13

Parameter:	**Multicast**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables support for Frame Relay multicast service.
Instructions:	Set to Enable if your Frame Relay subscription service provides multicast service, and if this Frame Relay interface should receive multicast messages.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.16

Parameter:	**Congestion Control**
Default:	Disable
Options:	Enable | Disable
Function:	Enables or disables congestion control on this interface.
Instructions:	Set to Enable to activate congestion control. This value tells the router to drop all outbound traffic destined for a PVC where congestion is occurring until the congestion clears. The value of this parameter affects all PVCs that you do not individually configure.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.22

Parameter:	**Congestion Timer**
Default:	1 second
Range:	0.5 to 5 seconds, in 0.5-second intervals
Function:	Specifies the length of time during which the router counts congestion notifications. If the router receives the number of congestion notifications set by the Congestion Counter parameter, the router stops transmitting data. The router resumes transmission once it stops receiving congestion notifications.
Instructions:	Set the length of time the router should count congestion notifications from the network. If you set this parameter for a long time period, the router may be less likely to stop transmission for an intermittent congestion condition. However, the router may be slow to detect congestion, resulting in long transmission delays once the congestion has cleared. The value of this parameter affects all PVCs that you do not individually configure.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.23

Parameter:	**Congestion Counter**
Default:	20 notifications
Range:	1 to 500 notifications
Function:	Indicates the maximum number of congestion notifications that the router can receive during the Congestion Timer period before it stops transmitting. If the router reaches the value set by this parameter, it determines the line is congested and stops transmitting.
Instructions:	Specify the congestion count. The smaller the number, the more quickly the router detects congestion and stops transmitting. The value of this parameter affects all PVCs that you do not individually configure.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.24

Parameter:	**Hangup on DLCMI Failure**
Default:	Disable
Options:	Enable | Disable
Function:	Indicates whether to terminate the backup connection if the Frame Relay switch does not initially respond to the call with a full status message.
Instructions:	Select Enable if you want the router to clear the backup circuit when the switch does not respond. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.1.1.32

Editing the Service Record Configuration

After configuring the interface parameters, you can configure the service records. The service records contain the PVCs.

To configure the service record

1. **Click on Services.**

   Site Manager displays the Frame Relay Backup Service List (Figure 9-10).

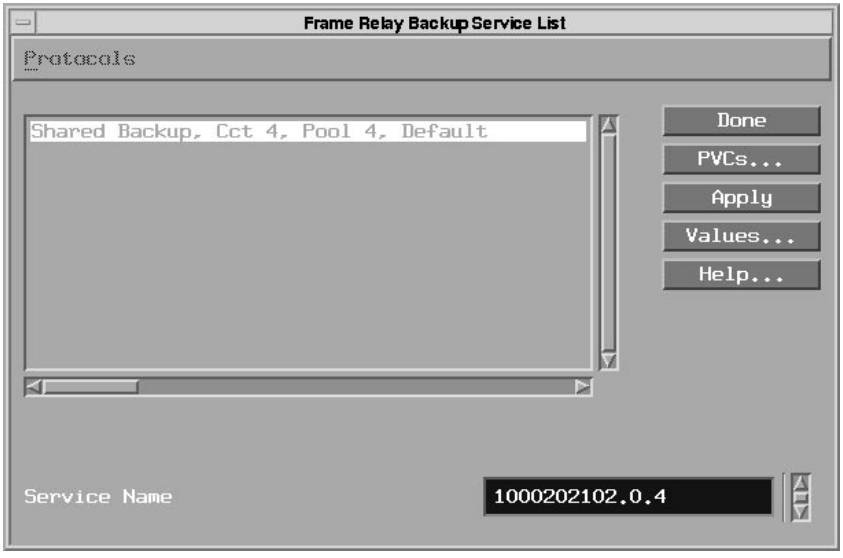


Figure 9-10. Frame Relay Backup Service List

2. **Enter a service name according to the parameter descriptions that follow this procedure.**
3. **Click on PVCs to configure the PVCs for the backup circuit.**

   Site Manager displays the Frame Relay Backup PVC List window (Figure 9-11).

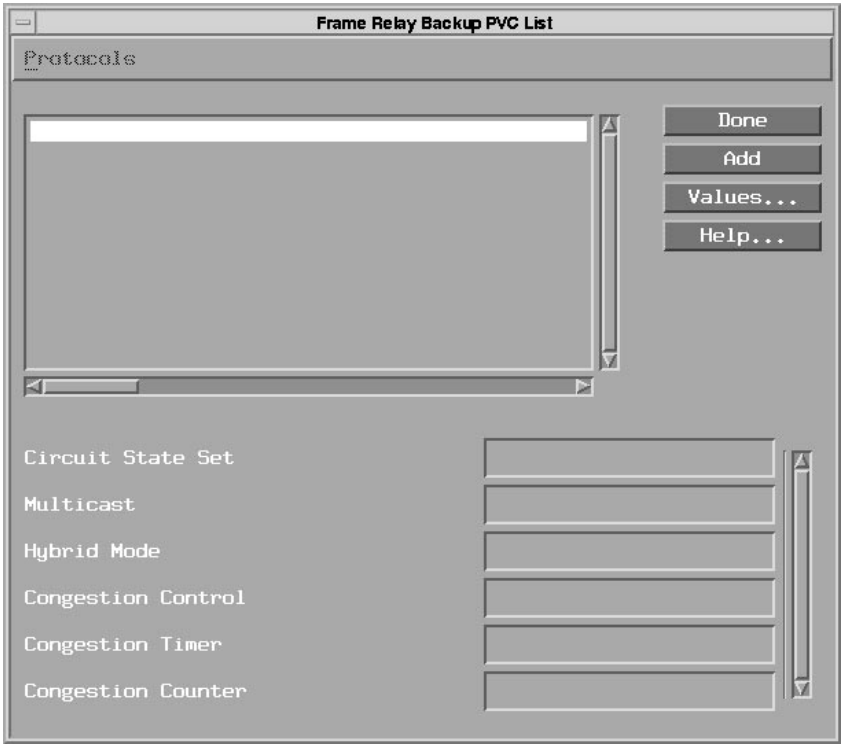


Figure 9-11. Frame Relay Backup PVC List Window

4. **Modify the PVC parameters according to the descriptions that follow this procedure.**

Backup Service List Parameter

Use this parameter description as a guideline for the service name.

Parameter:	**Service Name**
Default:	None
Options:	A variable length text string
Function:	Identifies the service record.
Instructions:	The router assigns a unique name for this parameter. Do not change it.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.5.1.7

Frame Relay PVC List Parameters

Use these parameter descriptions as guidelines when configuring PVCs for the backup circuit.

Parameter:	**Circuit State Set**
Default:	Active
Options:	Invalid | Active | Inactive
Function:	Specifies the state of the PVC.
Instructions:	Set to Active to indicate to a Frame Relay switch that the PVC is available for use. Set to Inactive to indicate that the PVC is configured, but not available for use, for example, before your switch provider actually activates the PVC. Choose Invalid if the PVC is configured, but the switch is unaware of it.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.2.1.7

Parameter:	**Multicast**
Default:	Unicast
Options:	Unicast | Multicast
Function:	Indicates whether this PVC is multicast or unicast.
Instructions:	Set to unicast or multicast according to PVC type, as the Frame Relay switch provider instructs.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.2.1.19

Parameter:	**Hybrid Mode**
Default:	Off
Options:	Off | On
Function:	Enables hybrid access mode, which enables you to combine bridging and routing across the Frame Relay interface.
Instructions:	Select On to use hybrid access mode. Otherwise, accept the default. For a Primary/Shared backup configuration, you may only accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.2.1.24

Parameter:	**Congestion Control**
Default:	Inherit
Options:	Disable | Enable | Inherit
Function:	Enables or disables congestion control on this interface.
Instructions:	Set to Enable to activate congestion control. This value tells the router to drop all traffic destined for a congested PVC until the congestion clears. Set to Inherit if you want the Congestion Control setting for this PVC to match the setting you specify for Congestion Control in the Frame Relay Interface List window.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.2.1.25

Parameter:	**Congestion Timer**
Default:	1 second
Range:	0.5 to 5 seconds, in 0.5-second intervals
Function:	Specifies the length of time during which the router counts congestion notifications. If the router receives the number of congestion notifications set by the Congestion Counter parameter, the router stops transmitting data. The router resumes transmission once it stops receiving congestion notifications.
Instructions:	Set the length of time the router should count congestion notifications from the network. If you set this parameter for a long time period, the router may be less likely to stop transmission for an intermittent congestion condition. However, the router may be slow to detect congestion, resulting in long transmission delays once the congestion has cleared. The value of this parameter affects all PVCs that you do not individually configure. Note, however, that if you set the Congestion Control parameter to Inherit, the PVC uses the DLCMI parameter for congestion control, not the value of this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.2.1.27

Parameter:	**Congestion Counter**
Default:	20 notifications
Range:	1 to 500 notifications
Function:	Sets the maximum number of congestion notifications that the router can receive during the Congestion Timer period before it stops transmitting.
Instructions:	Specify the congestion count. The smaller the number, the more quickly the router detects congestion and stops transmitting. Note, however, that if you set the Congestion Control parameter to Inherit, the PVC uses the DLCMI parameter for congestion control, not the value of this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.9.2.1.28

Configuring Filters for Shared Backup Configurations

If the interface type for this circuit is Primary/Shared, you can add priorities and outbound filters to prevent unwanted traffic across the Frame Relay backup interface.

To configure filters, click on Filters from the Backup Interface Definition window. Site Manager displays the Priority/Outbound Filters window (Figure 9-12).

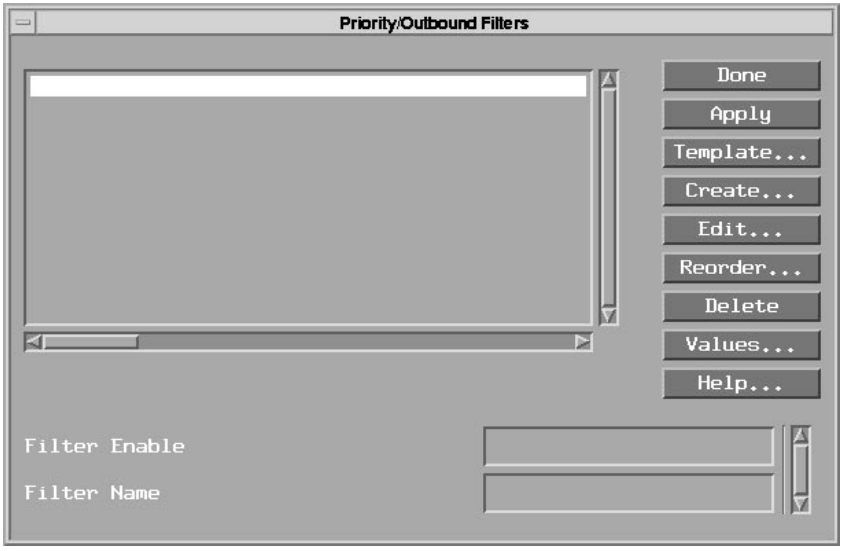


Figure 9-12. Priority/Outbound Filters Window

For instructions on how to configure outbound traffic filters, refer to *Configuring Traffic Filters and Protocol Prioritization*.

Configuring Filters for Secondary Backup Configurations

If the interface type for this circuit is Primary/Secondary, you can configure outbound traffic filters to prevent unwanted traffic across the Frame Relay backup interface. To configure outbound traffic filters, refer to *Configuring Traffic Filters and Protocol Prioritization*.

Scheduling When the Backup Circuit Is Available

Once you finalize the primary circuit's configuration, you can specify the time period that the backup is available for the primary circuit if it fails. To do this:

1. **Click on Schedule from the Primary Circuit Definition window (refer to Figure 9-5) or FR Primary Interface Definition window (refer to Figure 9-6).**

   Site Manager displays the Circuit Time of Day Schedule window (Figure 9-13).

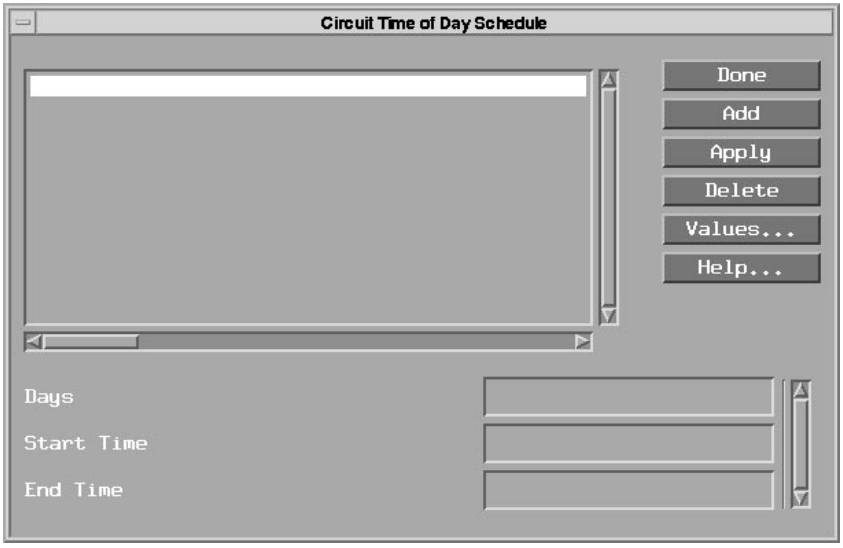


Figure 9-13. Circuit Time of Day Schedule Window

2. **Click on Add.**

   Site Manager displays the Circuit Time of Day Schedule window (Figure 9-14).

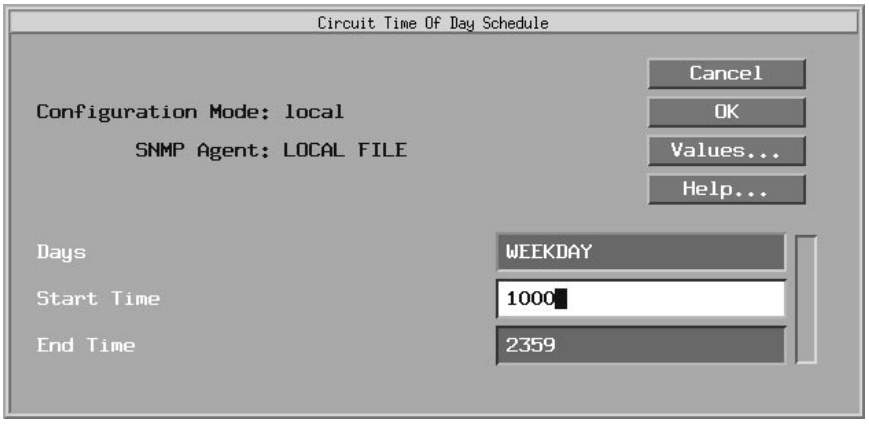


Figure 9-14. Circuit Time of Day Schedule Window

3. **Fill in the parameters using the descriptions that follow this procedure.**
4. **Click on OK after you specify a time interval.**

   Site Manager redisplays the Circuit Time of Day Schedule window (Figure 9-15).

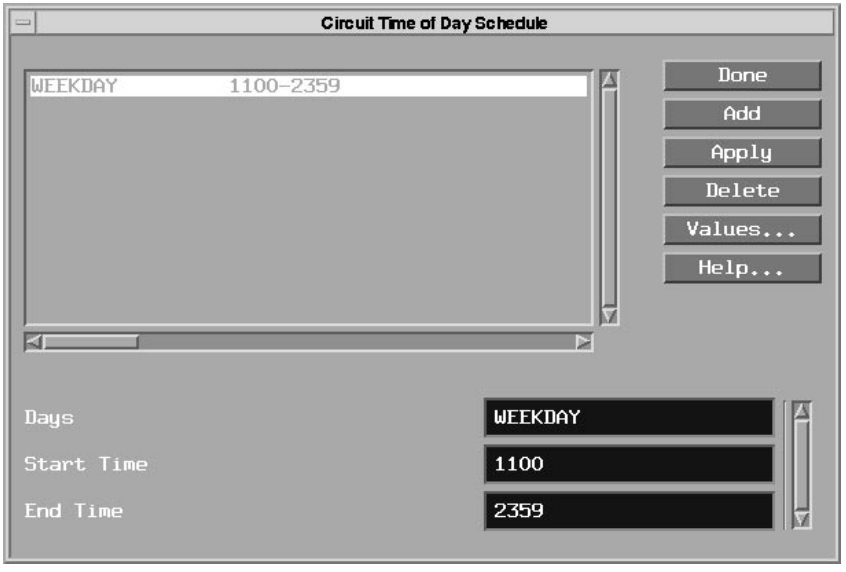


Figure 9-15. Completed Circuit Time of Day Schedule Window

5. **Continue clicking on Done until you return to the Configuration Manager window.**

Schedule Parameters

Use the following descriptions as guidelines when you configure the schedule parameters.

Parameter:	**Days**
Default:	Weekday
Options:	Monday through Sunday | Weekday | Weekend
Function:	Specifies the days that this circuit should be available.
Instructions:	Enter a specific day of the week; enter Weekday for the whole week; or enter Weekend for the whole weekend. Note that individual days of the week take precedence over the Weekday option. For example, the router will first provide a backup line scheduled for Monday between 9 a.m. and 11 a.m. before it provides a backup line scheduled for a Weekday between 8 a.m. and 12 noon.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.4

Parameter:	**Start Time**
Default:	0
Range:	0 to 2359
Function:	Specifies the time that a backup line is available for the primary line if it fails. The router uses this value along with the End Time parameter.
Instructions:	Enter an hour of the day, using the 24-hour-system of expressing time. For example, to activate the circuit at 5:00 p.m., enter 1700.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.5

Parameter:	**End Time**
Default:	2359
Range:	0 to 2359
Function:	Specifies the time that the backup line is no longer available for the primary line. The router uses this value along with the Start Time parameter.
Instructions:	Enter an hour of the day, using the 24-hour-system of expressing time. For example, to deactivate the circuit at 10:00 p.m., enter 2200.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.11.1.6

Deleting Backup Circuits

To delete a backup circuit, you change the primary circuit back to a normal circuit as follows:

1. **Select Dialup > Backup Circuits > Frame Relay.**

   Site Manager displays the Primary Circuit Definition window (refer to Figure 9-5).

2. **Click on Intf. Type.**

   Site Manager displays the Circuit Options window (refer to Figure 9-4).

3. **Change the Circuit Type parameter to Normal. Click on OK.**

   Site Manager asks you to confirm your change, then removes the backup circuits, and no longer treats this circuit as a primary circuit.

4. **Click on Done to return to the Configuration Manager window.**

Chapter 10
Configuring Bandwidth-on-Demand Circuits

To enable bandwidth-on-demand service, you designate a single leased circuit or leased multilink circuit as a *bandwidth-on-demand* circuit. If this circuit becomes congested, the router provides up to 29 dial-up circuits to relieve the congestion, providing a total of 30 communication lines.

Enabling Bandwidth-on-Demand Service

Before you configure bandwidth circuits, be sure that you have configured PPP multilink on the leased circuits that you will designate as bandwidth circuits.

To designate leased circuits as bandwidth circuits:

1. **Select Dialup > Bandwidth-on-Demand Circuits.**

   Site Manager shows the Bandwidth-on-Demand Circuit Definition window (Figure 10-1).

   This window lists the leased circuits that you previously selected when you first configured the physical interface.

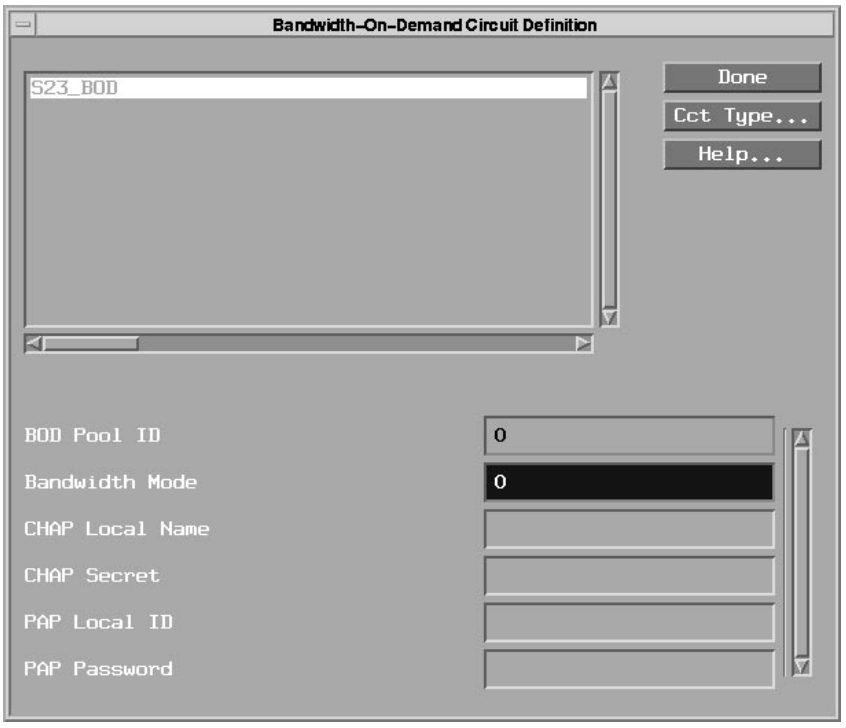


Figure 10-1. Bandwidth-on-Demand Circuit Definition Window

2. **Highlight a circuit and click on Cct Type.**

   The Circuit Options window appears (Figure 10-2).

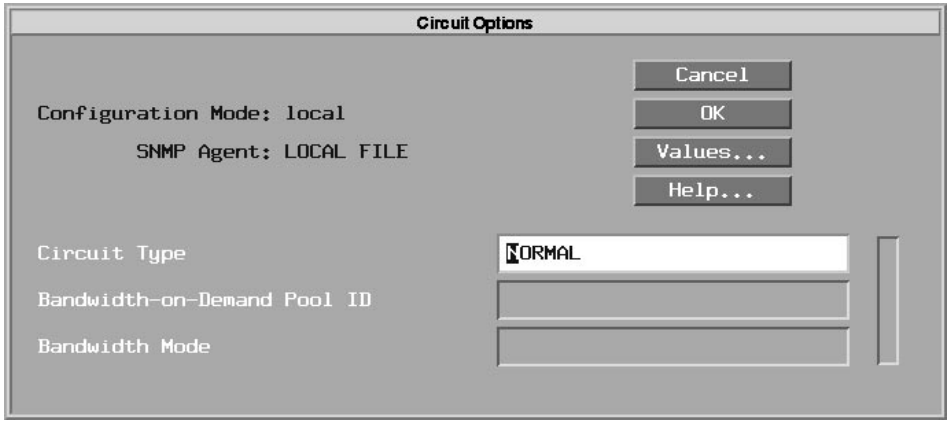


Figure 10-2. Circuit Options Window

3. **Enter values for these parameters, then click on OK. Refer to the parameter descriptions that follow this procedure as guidelines.**

   Note the instructions for the Bandwidth Mode parameter:

   a. **If you accepted the default, Non-Monitor:**

      Site Manager displays the Caller Resolution Info window. This window enables you to enter the CHAP Name or PAP ID of one of the remote routers that this circuit supports. This ensures that the local, non-monitor router receiving the call verifies the identity of the remote router placing the call.

      Enter values for the Caller Resolution parameters according to the descriptions in Chapter 12.

   b. **If you selected Monitor:**

      You are not prompted for caller resolution information. However, if this is the first Monitor circuit in a pool that uses multiple slots, Site Manager displays the Preferred/Reserved Slots for BOD Pool window (Figure 10-3).

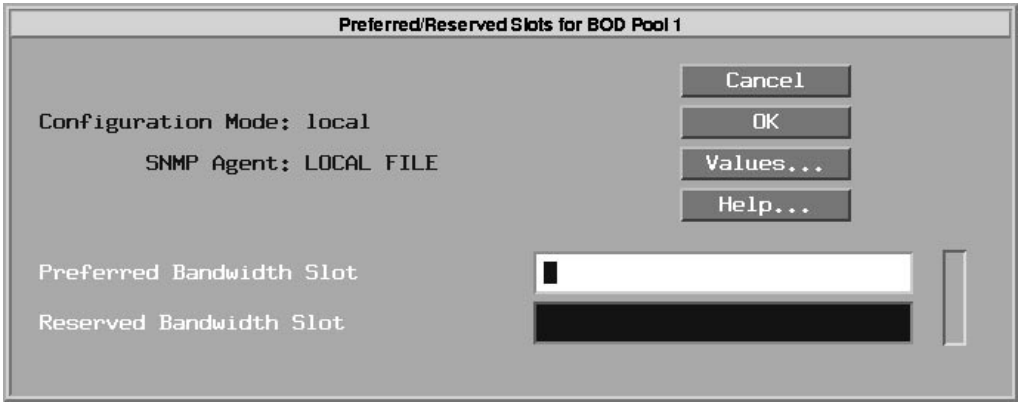


Figure 10-3. Preferred/Reserved Slots for BOD Pool Window

Enter a slot number for these parameters. Site Manager enters these same values into the Preferred and Reserved Bandwidth Slot parameters in the Monitor Options window (refer to Figure 10-5 on page 10-12).

4. **Click on OK when you are finished.**

   Site Manager returns to the Bandwidth-on-Demand Circuit Definition window (Figure 10-4).

5. **Click on Done to exit.**

When you configure a bandwidth circuit, Site Manager automatically creates a special PPP record for bandwidth-on-demand service. The circuit uses this generic record to identify who is calling the router.

This record appears in the PPP Interface Lists screen as follows:

```
Interface for Dialup Lines
```

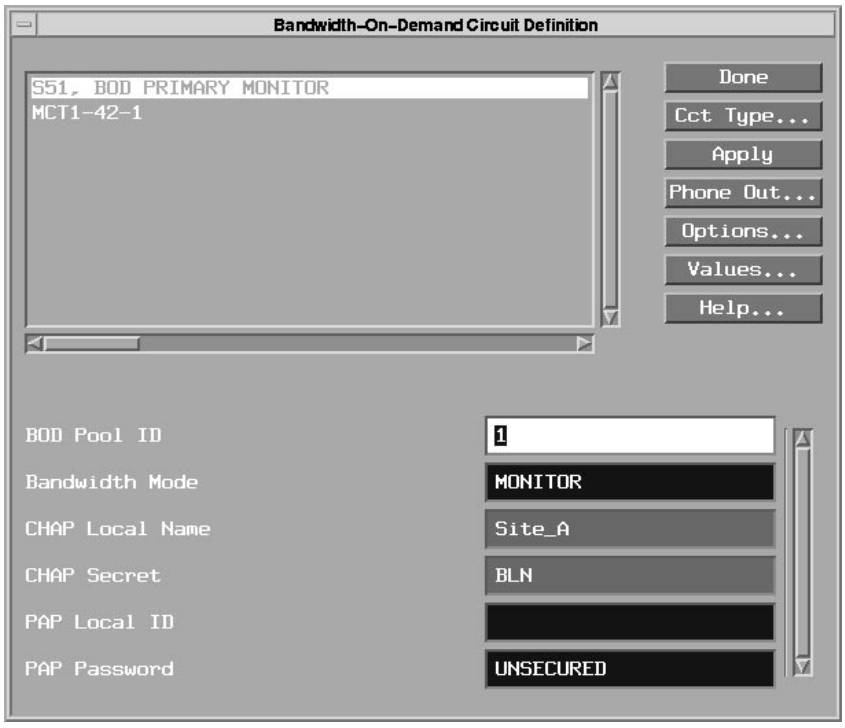


Figure 10-4. Completed Bandwidth-on-Demand Circuit Definition Window

Bandwidth-on-Demand Circuit Options Parameters

Parameter:	**Circuit Type**
Default:	Normal
Options:	Normal | Bandwidth-on-Demand
Function:	Specifies whether or not the leased circuit uses bandwidth-on-demand service. For a normal synchronous circuit, the router does not provide bandwidth-on-demand service. For a bandwidth circuit, the router provides up to 29 additional lines to carry traffic when the bandwidth circuit is congested.
Instructions:	Accept the default, Normal, if you do not want secondary circuits available for leased circuits. Select Bandwidth-on-Demand to provide bandwidth-on-demand service for a congested single circuit or multilink circuit. Site Manager lists the circuit type next to the circuit name. If you select Non-monitor for the Bandwidth Mode parameter, Site Manager will not allow you to enter values for the CHAP Local Name, CHAP Secret, PAP Local ID, and PAP Password. These parameters are part of configuring the router as congestion monitor.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.3

Parameter:	**Bandwidth-on-Demand Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the bandwidth pool associated with the bandwidth circuit.
Instructions:	If you select bandwidth-on-demand in the Circuit Type parameter, enter the ID of the bandwidth pool that this circuit should use. If you select Normal in the Circuit Type parameter, Site Manager does not allow you to enter a pool ID. You must create a pool before you can specify a circuit as a bandwidth circuit. The router first creates the circuit as a normal circuit. See Chapter 7 for instructions on creating line pools.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.35

Parameter:	**Bandwidth Mode**
Default:	Non-Monitor
Options:	Non-Monitor | Monitor
Function:	Determines whether or not the router serves as the congestion monitor. The level of congestion informs the router when to provide an additional circuit to carry data across the network.
Instructions:	Enter Monitor to instruct the router to watch the congestion on the line or bundle. Only one router on the link can serve as congestion monitor and bring up a secondary line. The router at the opposite end of the link must be set to nonmonitor. If both are set to monitor, they may try to bring up a secondary line simultaneously, resulting in a collision on the network. If you configure bandwidth-on-demand service to aid a demand circuit, and this parameter is set to Monitor, ensure the demand circuit's Connection Mode is either Collision Master or Collision Slave.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.36

Editing Bandwidth-on-Demand Circuit Parameters

After you designate a bandwidth circuit, Site Manager adds several buttons to the Bandwidth-on-Demand Circuit Definition window (Apply, Phone Out, Options) that allow you to edit the circuit.

To edit the bandwidth circuit:

1. **Highlight the desired circuit and enter new values for the parameters you want to edit, referring to the descriptions on page 10-8 for guidelines.**
2. **Click on Apply to save your changes.**
3. **Click on Done to return to the Configuration Manager window.**

Selecting CHAP or PAP for the Bandwidth Circuit

CHAP is the default authentication protocol. To select PAP, you must go to the PPP Interface List window, select the special line record for dial lines, and specify PAP in the Local Authentication Protocol parameter. For more information about PPP and configuring authentication protocols, see *Configuring PPP Services*.

Bandwidth-on-Demand Circuit Definition Parameters

Use the following descriptions for configuring the circuit definition parameters.

Parameter:	**BOD Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies the bandwidth pool associated with the bandwidth circuit.
Instructions:	If you select bandwidth-on-demand in the Circuit Type parameter, enter the ID of the bandwidth pool that this circuit should use. If you select Normal in the Circuit Type parameter, Site Manager does not allow you to enter a pool ID. You must create a pool before you can specify a circuit as a bandwidth circuit. The router first creates the circuit as a normal circuit. See Chapter 7 for instructions on creating line pools.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.35

Parameter:	**Bandwidth Mode**
Default:	Non-Monitor
Options:	Non-Monitor | Monitor
Function:	Determines whether or not the router serves as the congestion monitor. The level of congestion informs the router when to provide an additional circuit to carry data across the network.
Instructions:	Enter Monitor to instruct the router to watch the congestion on the line or bundle. Only one router on the link can serve as congestion monitor and bring up a secondary line. The router at the opposite end of the link must be set to nonmonitor. If both are set to monitor, they may try to bring up a secondary line simultaneously, resulting in a collision on the network.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.36

Parameter:	**CHAP Local Name**
Default:	None
Options:	Any text string; maximum 20 characters
Function:	This name is part of the outbound call, and it informs the remote peer routers of the calling router's identity. This parameter is only configurable if the bandwidth mode is Monitor. The router uses the CHAP name when it brings up the secondary line.
Instructions:	If you configure CHAP as the authentication protocol, specify a name for router identification. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.31

Parameter:	**CHAP Secret**
Default:	Unsecured
Options:	Any text string; maximum 20 characters
Function:	Specifies the CHAP Secret you assign to this interface. The CHAP Secret is for identification and security purposes, and it must be the same on both sides of the link. This parameter is only configurable if the bandwidth mode is Monitor. The router uses the CHAP Secret when it brings up the secondary line. When one router places a call to another router, an authentication process takes place. During this phase, the routers send challenge packets back and forth that include the CHAP Secret. Both routers on a link must have the same secret to correctly calculate responses to the challenges.
Instructions:	If you configure CHAP as the authentication protocol, specify the CHAP Secret. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.32

Parameter:	**PAP Local ID**
Default:	None
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP ID that you assign to this interface. This parameter is only configurable if the bandwidth mode is Monitor. This parameter identifies the calling router to the called router. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP ID or the called router sends an Authenticate Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection.
Instructions:	If you are using PAP as the authentication protocol, specify a unique PAP ID for this circuit. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.37

Parameter:	**PAP Password**
Default:	Unsecured
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP password that you assign to this interface. This parameter is only configurable if the bandwidth mode is Monitor. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct PAP password or the called router sends an Authenticate Negative Acknowledgment (Authenticate-NAK) and does not bring up the connection.
Instructions:	If you are using PAP as the authentication protocol, specify a unique PAP password for this circuit. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.38

Parameter:	**Outbound Authentication**
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether the router performs authentication when it places an outbound call. Disabling outbound authentication improves interoperability with devices that do not perform two-way authentication or do not support CHAP.
Instructions:	Accept the default, Enable, if you want to use two-way authentication, that is, both sides of the connection will authenticate the other's identity. Select Disable to use one-way authentication, which means that the authentication process occurs on only one side of the connection.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.48

Monitoring Congestion on the Bandwidth Circuit

If the Bandwidth Mode parameter is set to Monitor, you must configure the parameters that enable the router to monitor congestion on the bandwidth circuit. These parameters determine if the router needs to add more lines.

To configure the monitor parameters, follow these steps.

1. **Click on Options. Site Manager displays the Bandwidth-on-Demand Monitor Options window (Figure 10-5).**

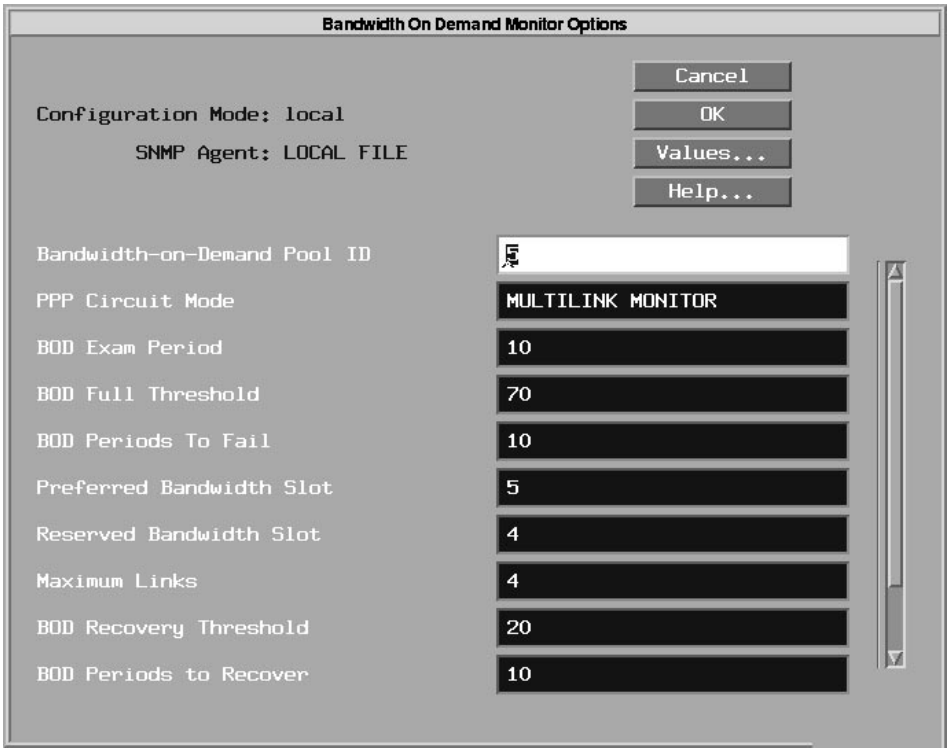


Figure 10-5. Bandwidth-on-Demand Monitor Options Window

2. **Enter values for the parameters according to the descriptions in the next section.**

Note: Properly configuring the Preferred Bandwidth Slot and Reserved Bandwidth Slot parameters depends on the slots that each pool uses, and whether there are Monitor circuits already in the pool. Refer to the parameter descriptions for details.

3. **Click on OK to save your changes.**

Congestion Monitor Parameters

Although Site Manager provides default values for these parameters, edit them for your network applications. If the network is critical to your operations and you want to ensure expedient data transmission, you want to customize your threshold values so that even with moderate congestion, the router brings up additional lines. Do not forget to account for data compression.

The cost of using additional lines also may affect how often you want the router to activate them.

Note: You can set the threshold parameters only if you set the PPP Circuit Mode to Multilink Monitor.

Parameter:	**Bandwidth-on-Demand Pool ID**
Default:	None
Range:	1 to 255
Function:	Identifies an existing bandwidth pool.
Instructions:	Enter the ID number for the bandwidth pool you want the circuit to use.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.5.1.35

Parameter:	**PPP Circuit Mode**
Default:	Multilink
Options:	Multilink | Multilink Monitor
Function:	Specifies the type of multilink connection to this interface. This parameter value also determines the value of the PPP interface parameter PPP Mode.
Instructions:	Accept the default, Multilink, to enable PPP multilink for this circuit (and if you set the Bandwidth Mode parameter to Non-monitor). In addition, selecting this value prevents you from configuring the other monitor parameters. Select Multilink Monitor to enable multilink and designate the router as the monitor router. For bandwidth-on-demand connections, the monitor router is responsible for monitoring congestion on the bandwidth circuit. If you configure bandwidth-on-demand service to aid a demand circuit, and this parameter is set to Monitor, ensure the demand circuit's Connection Mode is either Collision Master or Collision Slave.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.50

Parameter:	**BOD Exam Period**
Default:	10 (0.10-second intervals)
Range:	5 to 200, in 0.10-second intervals
Function:	Indicates how often the router checks the bandwidth circuit to determine if the line or bundle is congested.
Instructions:	Enter a value specifying how often you want the router to check the congestion on the bandwidth circuit. For example, entering a value of 200 means that the router checks the line every 20 seconds (200 x 0.10-seconds = 20 seconds).
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.52

Parameter:	**BOD Full Threshold**
Default:	70 percent
Range:	10 to 400 percent
Function:	Specifies a percentage of the maximum amount of data that the router transmits and receives. This is the percentage the data traffic must reach or exceed before the router considers the line or bundle congested.
Instructions:	Enter a percentage threshold that the router uses as a measure of congestion. If you configured data compression on the circuit, you may want to configure a threshold greater than 100 percent.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.53

Parameter:	**BOD Periods to Fail**
Default:	10
Range:	1 to 100
Function:	Specifies the number of consecutive times the router finds that data traffic on the bandwidth circuit is above the configured congestion threshold, thereby concluding that the line or bundle is congested.
Instructions:	Enter the number of consecutive times the circuit can exceed the threshold before the router brings up a secondary line.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.54

Parameter:	**Preferred Bandwidth Slot**
Default:	None
Options:	Available slots in the bandwidth pool. For example, if the bandwidth pool has lines from Slot 3 and Slot 4, you cannot enter a value of 5.
Function:	Specifies the slot the router chooses first when adding a line to a multilink bundle.
Instructions:	Enter the slot number that you want the router to use first, but note the following: • Site Manager looks for another Monitor circuit in the same pool as the newly created Monitor circuit. If one exists, Site Manager copies the setting for the existing circuit's Preferred Bandwidth Slot and enters it for this parameter. You do not have to enter a value. • If this is the first Monitor circuit in a pool that uses only one slot, Site Manager automatically enters the slot number. You do not have to enter a value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.55

Parameter:	**Reserved Bandwidth Slot**
Default:	None
Options:	Available slots in the bandwidth pool. For example, if the bandwidth pool has lines from Slot 3 and Slot 4, you cannot enter a value of 5.
Function:	Specifies the slot the router chooses when adding a line to a multilink bundle if the preferred slot cannot provide a line.
Instructions:	Enter the slot number that the router should use after checking the preferred slot, but note the following: • Site Manager looks for another Monitor circuit in the same pool as the newly created Monitor circuit. If one exists, Site Manager copies the setting for the existing circuit's Reserved Bandwidth Slot and enters it for this parameter. You do not have to enter a value. • If this is the first Monitor circuit in a pool that uses only one slot, Site Manager automatically enters the slot number. You do not have to enter a value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.56

Parameter:	**Maximum Links**
Default:	4
Range:	1 to 30
Function:	Specifies the maximum number of links (both leased and dial-up lines) allowed in the multilink bundle for this circuit at any one time.
Instructions:	Enter the maximum number of links that you want in the bundle.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.58

Parameter:	**BOD Recovery Threshold**
Default:	50 percent
Range:	10 to 100 percent
Function:	Specifies a percentage of the maximum amount of data that the router transmits and receives. The actual flow of data traffic must fall below this percentage before the router returns to the leased line or bundle exclusively.
Instructions:	Enter a percentage that the router should reach before it returns to the leased line or bundle.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.59

Parameter:	**BOD Periods to Recover**
Default:	10
Range:	1 to 100
Function:	Specifies the number of consecutive times the router checks the bandwidth circuit and determines that data traffic is below the configured congestion threshold, thereby concluding that the line is no longer congested. The router returns to the leased line or bundle exclusively.
Instructions:	Enter the number of times the router should check if there is no longer a congestion condition before bringing down the secondary line.
MIB Object ID:	1.3.6.1.4.1.18.3.4.5.1.60

Parameter:	**Multilink Fragmentation**
Default:	Permitted
Options:	Permitted | Prohibited
Function:	Enables the router to break up the data packet into smaller segments for more efficient transfer across the multilink circuit.
Instructions:	Accept the default, Permitted, to enable fragmentation. Otherwise, select Prohibited.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.51

Parameter:	**Fragmentation Trigger Size**
Default:	256
Range:	64 to 4000
Function:	Specifies the minimum packet size that the router will segment into smaller fragments.
Instructions:	Enter the size at which the router fragments the packet.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.2.1.57

Changing Preferred/Reserved Slots for Bandwidth Circuits

You can edit the Preferred and Reserved Bandwidth Slot from the Monitor Options window (refer to Figure 10-5) as well as the Bandwidth-on-Demand Pools window, as follows:

1. **Click on Priority in the Bandwidth-on-Demand Pools window (Figure 10-6).**

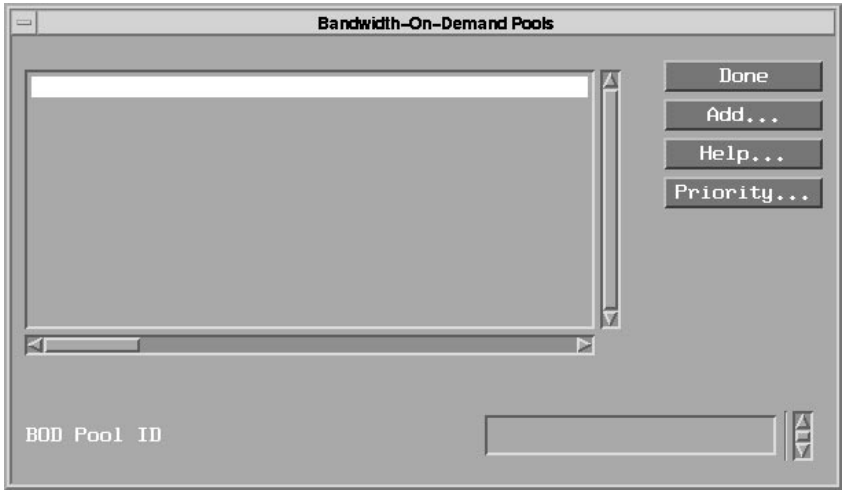


Figure 10-6. Bandwidth-on-Demand Pools Window

Site Manager displays the Preferred/Reserved Slots for BOD Pool window (Figure 10-7).

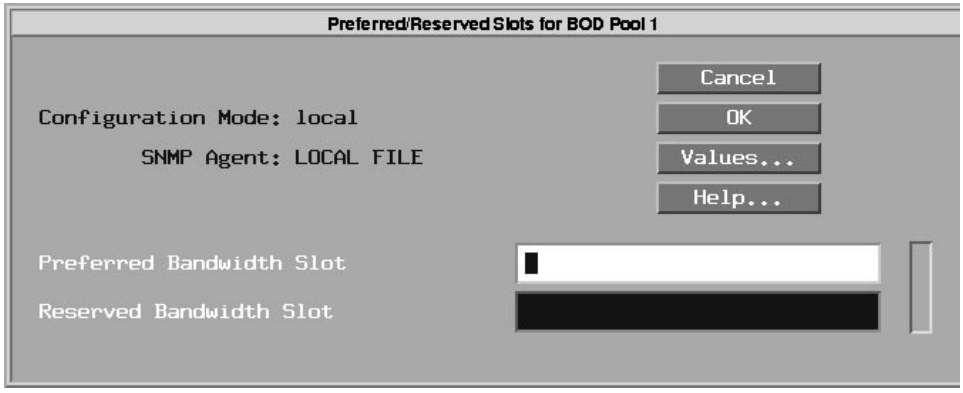


Figure 10-7. Preferred/Reserved Slots for BOD Pool Window

2. **Enter new values for each slot parameter. Refer to page 10-16 for a description of these parameters.**

Note that the values you enter here affect all the circuits in the pool. Also, Site Manager will enter the values from this window into the Monitor Options window (refer to Figure 10-5).

If you change the slots from which you choose lines for a bandwidth pool, and the Bandwidth Mode parameter for these lines is Monitor, Site Manager prompts you to enter new values for the Preferred and Reserved Bandwidth Slot parameters. Refer to page 10-16 for parameter descriptions.

Deleting Bandwidth Circuits

To delete a bandwidth circuit, you change the bandwidth circuit back to a normal circuit as follows:

1. **Select Dialup > Bandwidth-on-Demand Circuits.**

   Site Manager displays the Bandwidth-on-Demand Circuit Definition window (refer to Figure 10-4).

2. **Click on Cct Type.**

   Site Manager displays the Circuit Options window (refer to Figure 10-2).

3. **Change the Circuit Type parameter to Normal. Click on OK.**

   Site Manager asks you to confirm your change, then deletes the secondary circuits and no longer treats the leased circuit as a bandwidth circuit.

4. **Click on Done to return to the Configuration Manager window.**

Chapter 11
Configuring Phone Lists

If any of the lines in your demand, backup, or bandwidth pool are ISDN lines or synchronous lines using V.25bis signaling, you must provide the router with the list of telephone numbers that it uses for calls to and from remote routers. When you configure a line for Raise DTR signaling, the router ignores the phone lists.

Phone Lists for ISDN and V.25bis Dialing

You may define two phone lists for the router: the *outgoing phone list* and the *incoming phone list* (only for ISDN). Each telephone number in these lists is the phone number of a remote router, which may have one or more phone numbers.

Outgoing phone lists are associated with a specific circuit, not with the line. The lines in the pool may be used by many different circuits, which is why the telephone numbers are part of each circuit's configuration and not the line's configuration.

Using a Phone List for Placing ISDN Calls

The router uses the outgoing phone list to place a call to a remote router on an ISDN network.

The router uses the incoming phone list to implement incoming filtering for call screening. If incoming filtering is set to Enable, the router will match the calling party's phone number with a number on its incoming phone list. The router must be able to identify the calling party and verify that the party is an authorized caller.

To create outgoing and incoming phone lists, follow the instructions in the sections that follow.

Using a Phone List for Placing V.25bis Calls

For V.25bis calls to a network, the router passes the remote node's phone number to the dial device to establish a connection. The router uses the outgoing phone list for this purpose. To create an outgoing phone list, see the instructions that follow.

Creating an Outgoing Phone List

To create an outgoing phone list:

1. **Select Dialup > Demand, Backup, or Bandwidth-on-Demand Circuits from the Configuration Manager window.**

   For backup and bandwidth circuits, Site Manager displays the appropriate Circuit Definition window (refer to Figure 11-1 as an example). For Demand Circuits, Site Manager displays the Demand Pools window. From here, you click on Circuits to access the Demand Circuits window.

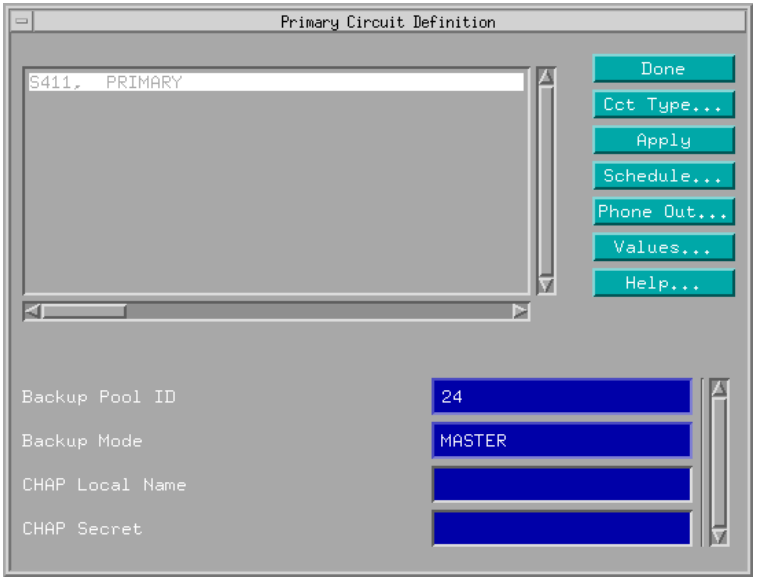


Figure 11-1. Primary Circuit Definition Window with Phone Out Button

2. **Highlight the circuit you want and click on Phone Out.**

   Site Manager displays the Outgoing Phone List window (Figure 11-2).

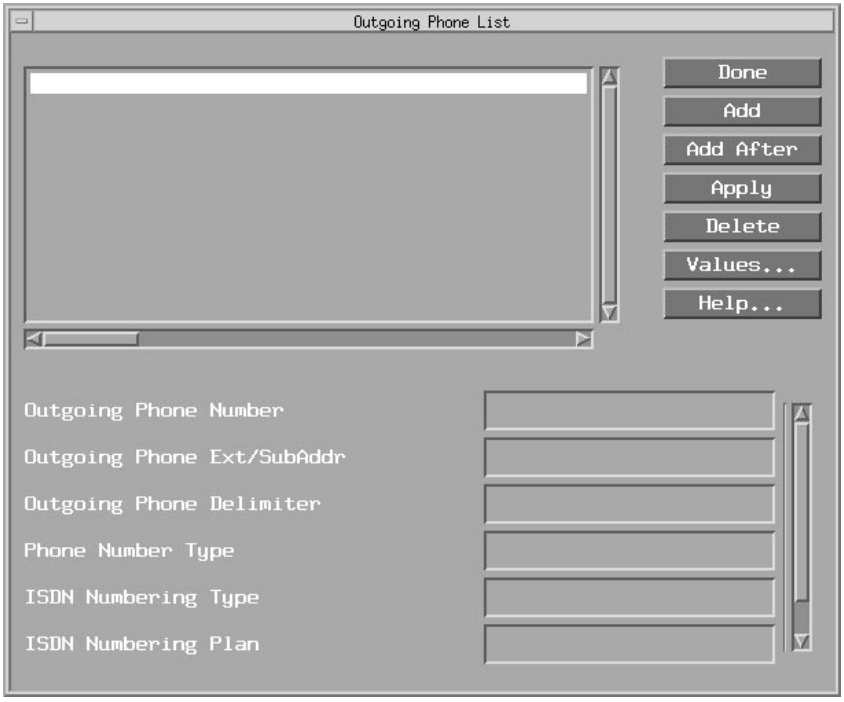


Figure 11-2. Outgoing Phone List Window

3. **Click on Add to display the Phone Number window (Figure 11-3).**

Figure 11-3. Phone Number Window

4. **Enter the appropriate values in this window, referring to the parameter descriptions beginning on page 11-7.**

5. **Click on OK.**

   Site Manager redisplays the completed Outgoing Phone List window with the phone number parameters and list filled in (Figure 11-4).

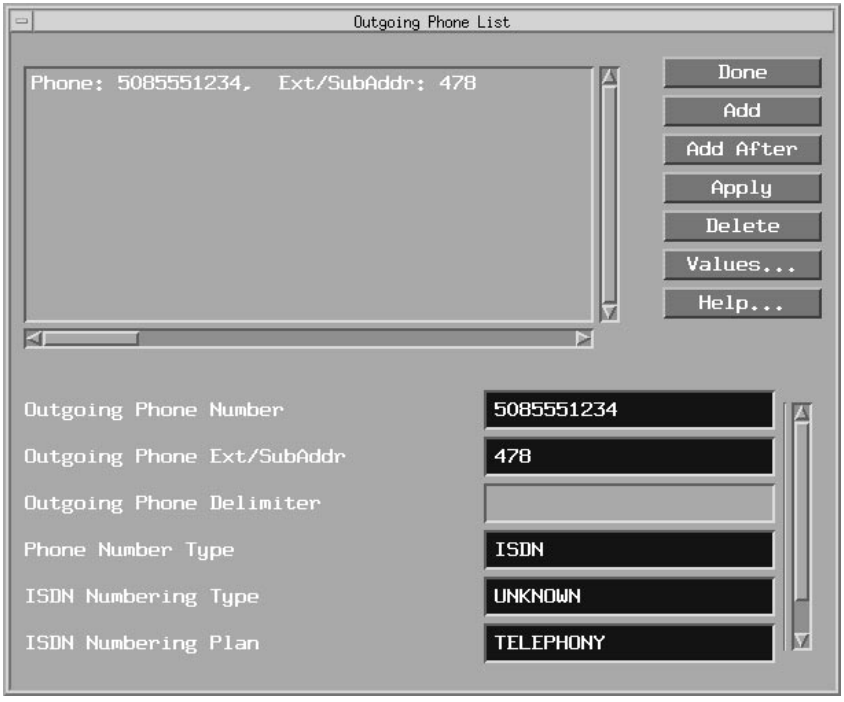


Figure 11-4. Completed Outgoing Phone List Window

6. **To enter phone numbers for an ISDN line, modify the Phone Number Type parameter to ISDN and fill in the ISDN Numbering Type and ISDN Numbering Plan parameters, according to the descriptions that follow these procedures.**
7. **Click on Done when you finish entering outgoing telephone numbers.**
8. **Continue clicking on Done until you return to the Configuration Manager.**

To modify the phone list, display the Outgoing Phone List window (refer to Figure 11-4) and follow these guidelines:

- **Order of numbers:** The order in which you enter the telephone numbers is the order in which the router dials the numbers. To insert a number between two existing numbers, highlight the number above the location of the new number, and click on Add After.
- **Changing numbers:** If you want to change a telephone number, highlight the telephone number and extension, if any. Enter the new telephone number and extension number in the Outgoing Phone Number and Extension parameters and click on Apply. The telephone number appears with the changes.
- **Deleting numbers:** If you want to delete a telephone number, highlight the telephone number and extension, if any, and click on Delete. Site Manager deletes the number.

Outgoing Phone List Parameter Descriptions

Parameter:	**Phone Number**
Default:	None
Options:	Up to 25 numeric characters
Function:	Specifies the telephone number of the remote router.
Instructions:	Enter the telephone number of the remote router. Do not enter space, special, or alphabetical characters in the telephone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.4

Parameter:	**Phone Ext/SubAddr**
Default:	None
Options:	Up to 25 numeric characters
Function:	For V.25bis and ISDN calls, specifies a subaddress or extension for a main phone number that further identifies the remote router. For ISDN calls, this subaddress is useful when you have several routers at a destination site, but the ISDN provider only assigns one phone number to the destination site. An incoming call must specify the number and the subaddress to reach a specific router.
Instructions:	Enter the extension/subaddress. Do not enter space, special, or alphabetical characters in the telephone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.5

Parameter:	**Phone Delimiter**
Default:	None
Options:	Any string up to 5 characters. An example of a single-character delimiter is a back slash (\).
Function:	For V.25bis calls only, it separates the phone number from the extension.
Instructions:	Enter a delimiter if the remote device that the router is calling requires one between the phone number and the extension. Be sure that you use a character or set of characters that the remote device accepts.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.6

Parameter:	**Phone Number Type**
Default:	ISDN
Options:	Dial Sync | Dial Async | ISDN
Function:	Distinguishes whether the phone number is for a V.25bis connection with an external dial device, for example, a modem or a TA, or a direct ISDN network connection, for a router with an integral ISDN module. Additionally, it indicates whether this number is for a sync, async, or ISDN connection.
Instructions:	If the router is using a V.25bis line with an external dial device, choose the dial option appropriate for the interface. If the router establishes the connection over an ISDN line, accept the default, **ISDN**. Note that if you accept ISDN, you must also fill in values for the ISDN Numbering Type and Numbering Plan parameters. If you have a line pool with both ISDN and V.25bis lines, the destination phone number for these two lines may be the same. If this is the case, you need to enter the destination phone number twice, once as type **ISDN** and once as type **Dial Sync** or **Dial Async**. The router then has the two lines that it may choose from to dial the call.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.7

Parameter:	**ISDN Numbering Type**
Default:	Unknown
Options:	Unknown | International | National | Specific | Subscriber | Abbreviated
Function:	This parameter indicates the standard that the phone number format follows. The router passes this information to the ISDN switch.
Instructions:	Accept the default value, Unknown, unless your service provider explicitly instructs you to use another value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.8

Parameter:	**ISDN Numbering Plan**
Default:	Telephony
Options:	Unknown | Telephony | X121 | Telex | Standard | Private
Function:	This parameter indicates the standard that the phone number plan follows. The router passes this information to the ISDN switch.
Instructions:	If you set the Switch Type parameter to BRI NTT, BRI KDD, or BRI NI1 accept the default value, Unknown. For all other switch types, Site Manager uses the value Telephony. Accept this value unless your service provider explicitly instructs you to use another value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.9

Parameter:	**Adaption Rate**
Default:	64K
Options:	64K | 56K
Function:	For ISDN calls only, specifies the rate at which the local router wants to send data to the remote destination.
Instructions:	Enter a value of 56 K if the connections to the destination device only support this rate. Otherwise, accept the default. If you are unsure of your network connections, ask your network provider. If the value of this parameter is less than the value of the Global Adaption Rate parameter, then this value overrides the Global Adaption Rate value. For example, if this parameter is set to 56 Kb/s and the Global Adaption Rate is set to 64 Kb/s, the router uses the rate of 56 Kb/s for the outgoing call. If the value of the parameters is equal, or only the Global Adaption Rate parameter is set, the router uses the global value and ignores the outgoing phone number's value. If no value is set for either parameter, the router uses the default, 64 Kb/s.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.10

Parameter: **Remote Pool Type**

Default: Dial and Bandwidth on Demand

Options: Dial on Demand │ Bandwidth on Demand │ Dial and Bandwidth on Demand

Function: Specifies whether the remote router's line associated with the outgoing phone number is in a demand pool, bandwidth pool, or both. The router then uses only the outgoing phone numbers whose value for this parameter match the pool type of the destination connection. This parameter is for applications that use bandwidth-on-demand to aid congested demand circuits.

By configuring the Remote Pool Type, you prevent the local circuit from using a phone number associated the wrong type of remote pool. If a demand circuit places a call to a bandwidth pool, the remote router would terminate the connection.

Instructions: Enter the type of remote line pool associated with the outgoing phone number. Use the following guidelines:

- Enter Dial on Demand if the line connected to the remote router is only in a demand pool.
- Enter Bandwidth-on-Demand if the line connected to the remote router is only in a bandwidth pool.
- Enter Dial and Bandwidth-on-Demand if the line connected to the remote router is in a demand and bandwidth pool.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.11

Parameter:	**Connection Type**
Default:	Multiple
Options:	Single | Multiple
Function:	Indicates whether the router uses the phone number for a single call or multiple calls for applications that use bandwidth-on-demand to aid congested demand circuits. If you select Single, the router checks whether this phone number is already in use for a circuit on the same slot. If the remote device is already busy, the router does not attempt to place the call using this number. Choosing the Single option is particularly important if the line is connected to an external device such as a modem. If the router places a call to device that is busy, it takes a long time before the router determines that the device is unavailable. By selecting Single, you eliminate this loss of time. If you select Multiple, the router can use the phone number for many calls. For example, if you are using PRI service, you have many channels that can use the same phone number to place a call. Therefore, you would select Multiple for this parameter.
Instructions:	Choose Single if the remote destination can only support a single connection with this outgoing phone number. If a circuit on the same slot is already using this phone number, the router will use another phone number in the list. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.12

Parameter:	**Channel Bandwidth Type**
Default:	BChannel
Options:	BChannel | Multirate
Function:	Determines whether this call uses multirate service. This parameter is only applicable for PRI interfaces on an MCT1 Net module.
Instructions:	If you purchased multirate service from your service provider, select Multirate. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.6.1.13

Parameter: **Aggregate Bandwidth**

Default: 128K (2*64K)

Range: The range for this field is as follows:

128K (2*64K)	1088K (17*64K)
192K (3*64K)	1152K (18*64K)
256K (4*64K)	1216K (19*64K)
320K (5*64K)	1280K (20*64K)
384K (6*64K)	1344K (21*64K)
448K (7*64K)	1408K (22*64K)
512K (8*64K)	1472K (23*64K)
576K (9*64K)	
640K (10*64K)	
704K (11*64K)	
768K (12*64K)	
832K (13*64K)	
896K (14*64K)	
960K (15*64K)	
1024K (16*64K)	

Function: Determines the total bandwidth, that is, the number of B channels in use for this PRI multirate call. This parameter is only applicable for PRI interfaces on an MCT1 net module.

Instructions: Select the number of B channels the router should use for calls to this remote destination. Remember that the call will fail if there are not enough available channels in the bandwidth pool.

MIB Object ID: 1.3.6.1.4.1.18.3.5.1.4.6.1.14

Creating an Incoming Phone List (ISDN Only)

To create an incoming phone list for ISDN call screening:

1. **Select Dialup > Incoming Phone Numbers from the Configuration Manager window.**

   Site Manager displays the Incoming Phone List window (Figure 11-5).

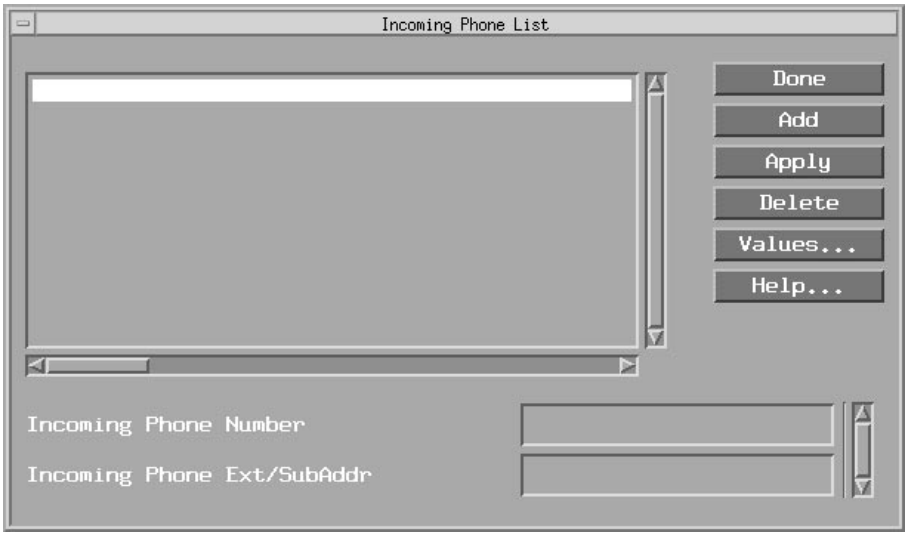


Figure 11-5. Incoming Phone List Window

2. **Click on Add to add a phone number. Site Manager displays the Phone Number window (Figure 11-6).**

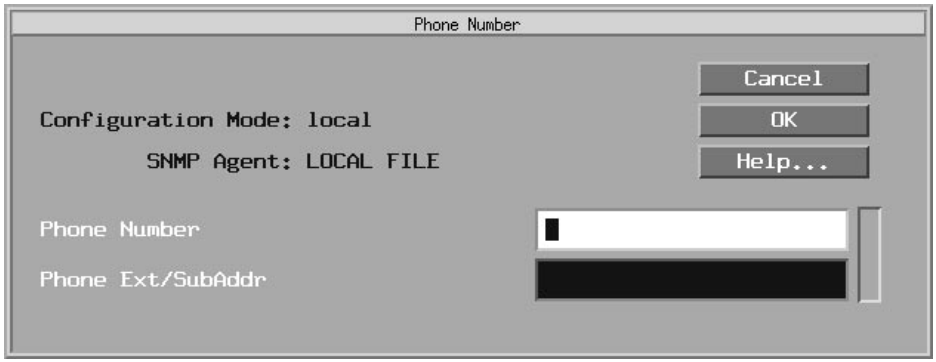


Figure 11-6. Phone Number Window

3. **Enter a phone number in this window, referring to the parameter description following this procedure, and click on OK.**

   Be sure to enter the phone numbers of all the remote nodes from which the router should accept calls.

   Site Manager redisplays the Incoming Phone List window with the phone number parameters and list filled in (Figure 11-7).

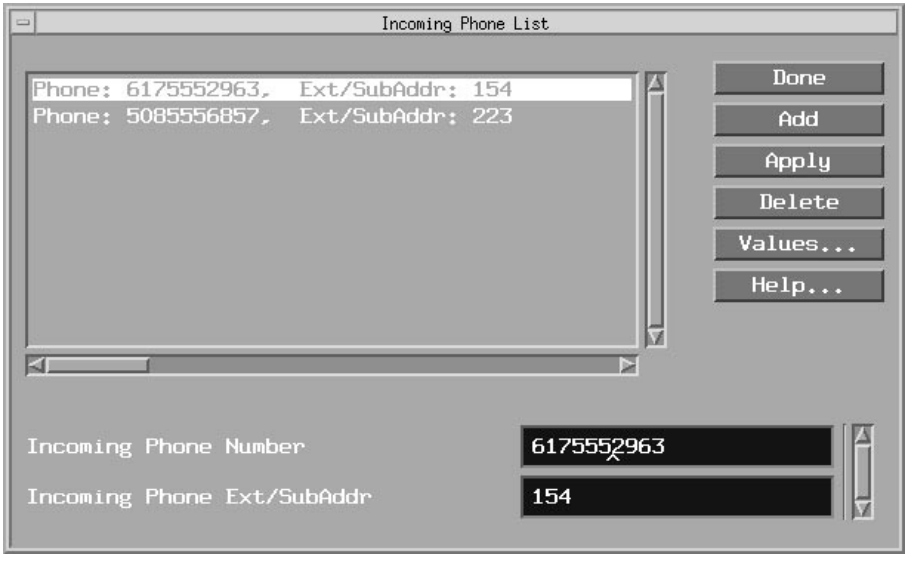


Figure 11-7. Completed Incoming Phone List Window for ISDN

4. **Click on Done when you finish entering telephone numbers.**

To modify the phone list, display the Incoming Phone List window (refer to Figure 11-5) and follow these guidelines:

- **Changing numbers:** If you want to change a telephone number, highlight the telephone number. Enter the new telephone number in the Incoming Phone Number parameter and click on Apply. The new telephone number appears.
- **Deleting Numbers:** If you want to delete a telephone number you entered, highlight the telephone number and click on Delete. The telephone number is deleted from the router.

Incoming Phone List Parameter Description

Parameter:	**Phone Number**
Default:	None
Options:	Up to 25 numeric characters
Function:	Specifies the telephone number of the remote router.
Instructions:	Enter the telephone number of the remote router. Do not enter space, special, or alphabetic characters in the telephone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.7.1.3

Parameter:	**Phone Ext/SubAddr**
Default:	None
Options:	Up to 25 numeric characters
Function:	Specifies a subaddress for a main phone number that further identifies the remote router. This subaddress is useful when you have several routers at a destination site, but the ISDN provider only assigns one phone number to the destination site. An incoming call must specify the number and the subaddress to reach a specific router.
Instructions:	Enter the extension/subaddress. Do not enter space, special, or alphabetical characters in the telephone number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.1.4.7.1.4

Chapter 12
Configuring Caller Resolution

All three dial services use a PPP identification mechanism to determine who is calling the router. PPP performs this identification process using one of two authentication protocols -- CHAP or PAP. For the dial connection, you must configure CHAP names or PAP IDs to implement the mechanism that identifies the calling party.

You enter CHAP names or PAP IDs in a caller resolution table and associate each name or ID with a demand, primary, or bandwidth circuit.

When a router places a call using CHAP or PAP, it includes its own local CHAP name or PAP ID during negotiation with the called router. The called router then looks up the name or ID in its caller resolution table to verify the caller and bring up the correct circuit.

Note: You must configure CHAP or PAP in the PPP interface configuration before setting up a caller resolution table. For more information, refer to Configuring PPP Services.

Configuring the Caller Resolution Table

Before you set up your caller resolution table, you should have already completed your dial-on-demand, dial backup, or bandwidth-on-demand configurations.

To configure the caller resolution table

1. **Select Dialup > Caller Resolution Table from the Configuration Manager window.**

   Site Manager displays the Caller Resolution Table window (Figure 12-1).

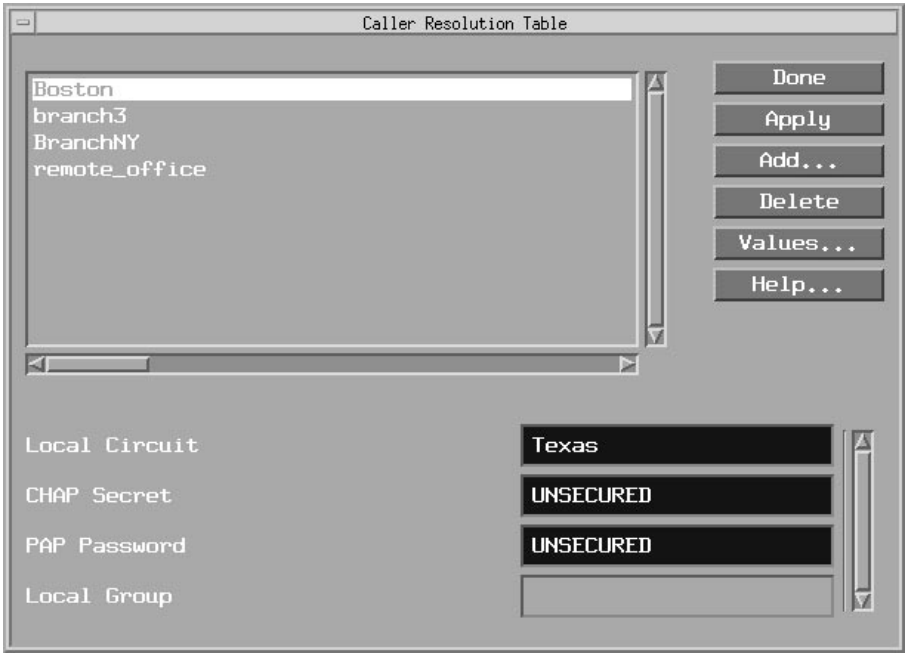


Figure 12-1. Caller Resolution Table Window

2. **Highlight a circuit and click on Add to add an entry to the table.**

   Site Manager displays the Caller Name and Secret/Password window (Figure 12-2).

Figure 12-2. Caller Name and Secret/Password Window

3. **Enter values for this window, referring to the parameter descriptions that follow these procedures.**

4. **Click on OK.**

   Site Manager displays the Local Circuit List window (Figure 12-3), which lists the demand or primary circuits that you previously configured.

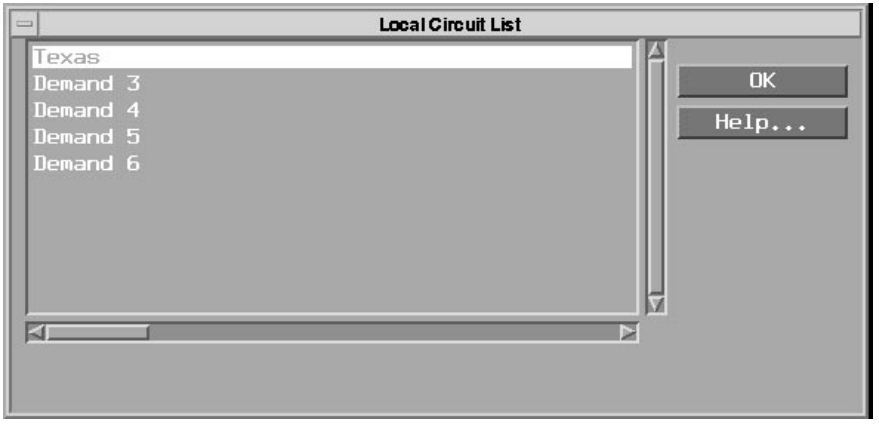


Figure 12-3. Local Circuit List Window

5. **Highlight a demand or primary circuit from this list, and click on OK.**

   Site Manager automatically assigns the highlighted circuit to the configured name and redisplays the Caller Resolution Table window with the name in the scroll box (Figure 12-4).

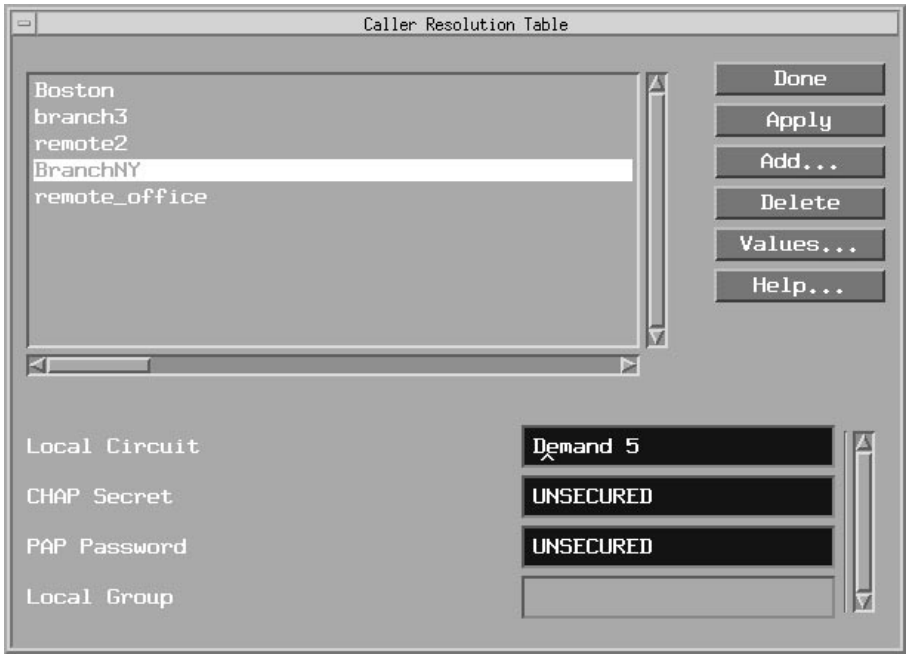


Figure 12-4. Completed Caller Resolution Table Window

6. **To delete an entry, select the entry and click on Delete.**
7. **Click on Done when you finish adding table entries.**

   The Configuration Manager window reappears.

Caller Resolution Table Parameters

Parameter:	**Local Circuit**
Default:	None
Options:	Available circuit name
Function:	Identifies a previously configured demand, primary, or bandwidth circuit that is associated with a specific CHAP name or PAP ID. The router brings up the circuit listed in this parameter when the circuit's associated CHAP name or PAP ID is part of the incoming call. If you enter a value for this parameter, you cannot enter a value for the Local Group parameter.
Instructions:	By selecting a circuit from the Local Circuit List window, Site Manager automatically fills in this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.3

Parameter:	**Caller Name**
Default:	None
Options:	Any text string; maximum 20 characters
Function:	This name is part of the incoming call and it informs the local router of the remote router's identity.
Instructions:	Enter a text string no longer than 20 characters that identifies a remote router. If you configure CHAP as the authentication protocol, you must enter a CHAP name for this parameter. If you configure PAP as the authentication protocol, you must enter a PAP ID for this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.2

Parameter:	**CHAP Secret**
Default:	Unsecured
Options:	Any text string; maximum 20 characters
Function:	Specifies the CHAP Secret you assign to this interface. The CHAP Secret is for identification and security purposes, and it must be the same on both sides of the connection. When one router places a call to another router, an authentication process takes place. During this phase, the routers send challenge packets back and forth that include the CHAP Secret. Both routers on a link must have the same secret to correctly calculate responses to the challenges.
Instructions:	If you configure CHAP as the authentication protocol, specify the CHAP Secret. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.4

Parameter:	**PAP Password**
Default:	None
Options:	Any text string; maximum 25 characters
Function:	Specifies the PAP password you assign to this interface. The PAP password is for identification and security purposes, and it must be the same on both sides of the connection. During the interface's authentication phase, all Password Authenticate-Request messages that the calling router sends to the called router must include the correct password. If the password is not correct, the called routers sends an Authenticate Negative Acknowledgment (Authenticate-NAK) message and the router does not bring up the connection.
Instructions:	If you configured PAP as the authentication protocol, specify a unique PAP password. If not, ignore this parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.5

Parameter:	**Local Group**
Default:	0
Range:	0 to 1000
Function:	Identifies the demand circuit group associated with the PAP ID or CHAP Name in the caller resolution table. This parameter applies only to the demand circuit group for this interface.
Instructions:	Enter the ID number of the demand circuit group that you want the PAP ID or CHAP Name to reference. The number must be between 1 and 1000. If you enter a value for this parameter, Site Manager does not allow you to select an individual circuit. Accept the default, 0, if you are configuring an individual circuit. By accepting the default, Site Manager prompts you to select a local circuit. This value is then entered for the Local Circuit parameter.
MIB Object ID:	1.3.6.1.4.1.18.3.5.9.2.3.1.6

Appendix A
Configuration Examples

This appendix provides examples for configuring the following applications:

- Dial-on-demand using V.25bis signaling
- Dial-on-demand over an ISDN network
- Dial backup using Raise DTR signaling with PPP and Bay Networks Standard over the primary line
- Dial backup over an ISDN network with PPP, Bay Networks Standard, and Frame Relay over the primary line

These examples show which parameters require changes from their default settings for proper configuration. A sample network picture illustrates each type of dial configuration. Each sample network picture is followed by a set of tables that include the configuration window path to reach the parameters and the correct parameter settings.

The ISDN examples (page A-7 and page A-18) assume the following:

- All the BRI interfaces use a National ISDN 1 (NI1) switch.
- No incoming filtering on the calls.
- Complete IEs are not used.
- The adaption rate is 64 Kb/s.
- CHAP is the PPP authentication protocol.
- IP is the only LAN protocol configured.
- The Ethernet segments listed on the network picture are not configured.
- Only one phone number and SPID are used. (BRI lines usually have two phone numbers and SPIDs.)

We assume that you are familiar with the configuration procedures for dial services. Refer to Chapters 4 through 8 for details. Refer to *Configuring Routers* or *Configuring Customer Access and Trunks (BNX Software)* for more information about setting up an interface on the router.

Dial-on-Demand Using PPP

Figure A-1 shows Routers 4 and 7 connected via a demand line. The demand line uses PPP and V.25bis signaling.

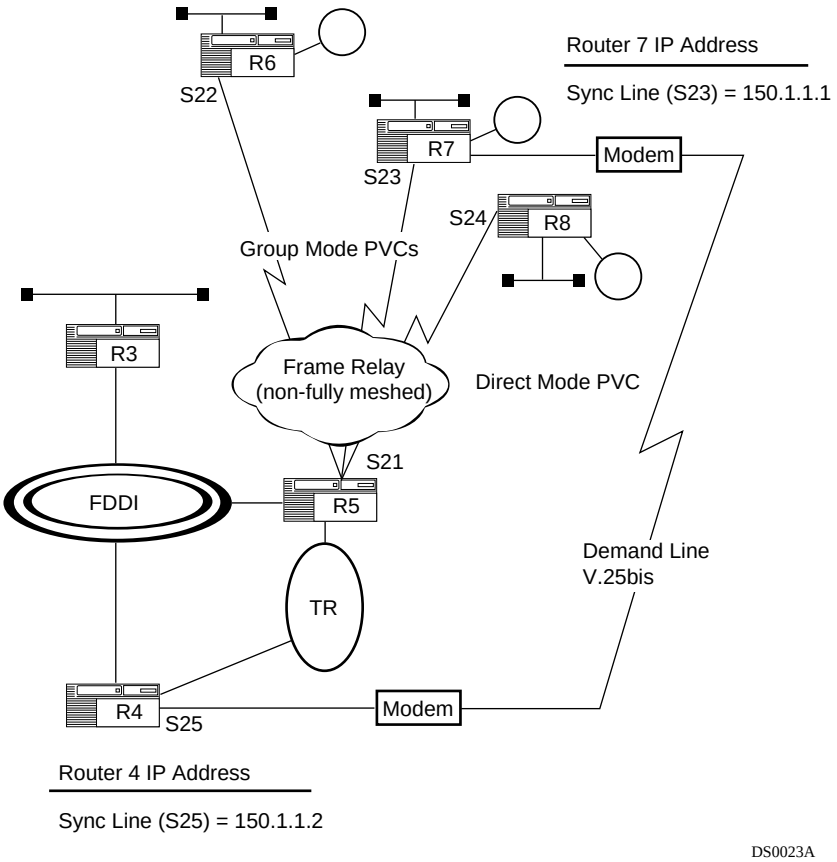


Figure A-1. Dial-on-Demand Configuration with PPP

Configuration of Routers 4 and 7

Configure Routers 4 and 7 as follows:

1. **Select a synchronous link module.**
2. **From the Configuration Manager window, click on a COM connector.**
3. **Follow the path of configuration windows that follow and set the parameters according to Tables A-1 through A-7.**

Note: The tables list only parameters whose default settings change.

Demand Pool Configuration

First, configure the demand pool. Select Dialup > Demand Pools from the main menu bar.

Table A-1. Demand Pool Parameters

Parameter Name	Router 4 (S25)	Router 7 (S23)
Pool ID	1	1

After entering a demand pool ID, the Demand Lines Definition window appears. Click on an available COM connector. Site Manager displays the WAN Serial Interface Type window, where you determine whether you want to use Sync or Async communication. Sync is the default, so no changes are needed.

Next, Site Manager displays the Line Media Type window.

Path: Demand Lines Definition window > Line Media Type window

Table A-2. Line Media Parameters

Parameter Name	Router 4 (S25)	Router 7 (S23)
Line Media Type	V.25bis	V.25bis
Cable Type	Default	Default
Priority	Default	Default

After you configure the line media parameters, return to the Configuration Manager window.

Demand Circuit Configuration

Once the demand pool is configured, configure the demand circuits. Select Dialup > Demand Circuits from the main menu bar. Site Manager displays the Demand Circuits window.

The Demand Circuits window has a Protocols button in the top left corner. Select Protocols > Add/Delete to configure protocols for the demand circuit. In this example, IP is the only protocol configured.

Path: Protocols > Select Protocols window

Table A-3. IP Parameters

Parameter Name	Router 4 (S25)	Router 7 (S23)
IP Address	150.1.1.2	150.1.1.1
Subnet Mask	255.255.255.0	255.255.255.0

Path: IP Configuration window > IP Adjacent Host window

Table A-4. IP Adjacent Host Parameters

Parameter Name	Router 4 (S25)	Router 7 (S23)
IP Adjacent Host	150.1.1.1	150.1.1.2

Path: IP Interface window > Demand Circuit window

Table A-5. Demand Circuit Parameters

Parameter Name	Router 4 (S25)	Router 7 (S23)
CHAP Local Name	BLN1 (case-sensitive)	BLN2 (case-sensitive)
CHAP Secret	East (case-sensitive)	East (case-sensitive)
Connection Mode	Default (Collision Master)	Collision Slave

Outgoing Phone List Configuration

From the Demand Circuits window, click on Phone Out to access the Outgoing Phone List window.

Path: Outgoing Phone List window > Phone Number window

Table A-6. Outgoing Phone List Parameters

Parameter Name	Router 4 (S25)	Router 7 (S23)
Phone Number	4362323 (Do not use hyphens or other non-numeric characters.)	4368989 (Do not use hyphens or other non-numeric characters.)

Caller Resolution Table Configuration

After configuring the demand circuits, configure the Caller Resolution Table. Select Dialup > Caller Resolution Table.

Path: Caller Resolution Table > Caller Name and Secret/Password window

Table A-7. Caller Resolution Parameters

Parameter	Router 4 (S25)	Router 7 (S23)
Caller Name	BLN2	BLN1
CHAP Secret	East	East

Path: Caller Name and Secret/Password > Local Circuit List window

The configured circuits are listed in the Local Circuit List window. Choose the demand circuit you created earlier.

Dial-on-Demand over an ISDN Network

Figure A-2 illustrates dial-on-demand configured on an ISDN network. In this configuration

- The BLN is using an MCT1 card (Port 2) for its PRI interface. The ISDN Switch type is PRI 5ESS.
- No IP static route configurations are listed for the Ethernet interfaces. (Typically, there would be static routes.)

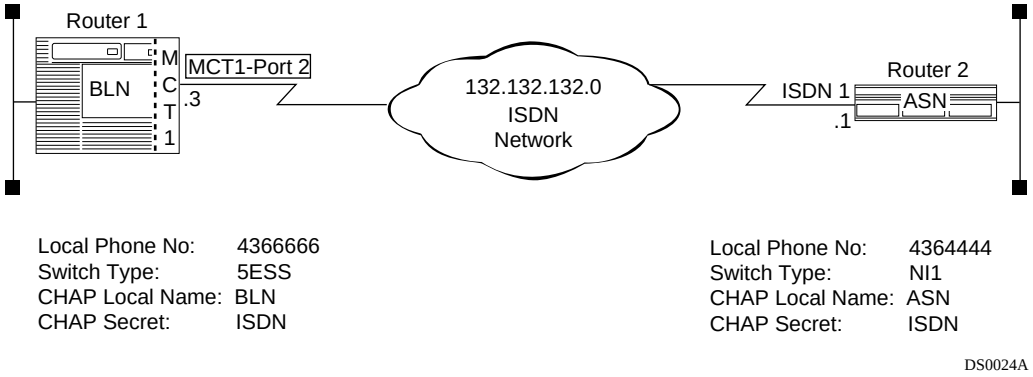


Figure A-2. Dial-on-Demand in an ISDN Network

Configuration of Router 1

To configure Router 1:

1. **Select an MCT1 link module.**
2. **From the Configuration Manager window, click on the MCT1-2 connector.**
3. **Follow the path of configuration windows shown and set the parameters according to Tables A-8 through A-17.**

Configuration of Router 2

To configure Router 2:

1. **Select an ISDN/BRI link module.**
2. **From the Configuration Manager window, click on an ISDN1 connector.**
3. **Follow the path of configuration windows shown and set the parameters according to Tables A-8 through A-17.**

Note: The tables list only parameters whose default settings change.

Port Application Mode Configuration

Begin by setting the Port Application Mode.

Path: MCT1/ISDN1 Connector > Port Application Mode window

Table A-8. Port Application Mode

Parameter Name	Router 1 (MCT1-2)	Router 2 (ISDN1)
Port Application Mode	PRI	Default (Dialup - 2B + D)

Path: Port Application Mode window > Clock Parameters window

Table A-9. MCT1 Clock Parameter (Router 1 Only)

Parameter Name	Router 1 (MCT1-2)	
Primary Clock	Port 2 Ext Loop	
The Port Parameters window appears next. Accept the default settings.		

Path: MCT1 or MCE1 Port Parameters window > PRI Timeslots window

Click on Select All in the PRI Timeslots window.

If you are using selective PRI service, that is, some B channels are blocked, the timeslots that you configure as B channels should be the same channels assigned by the switch provider. For example, if the provider gives you channels 1 to 10, configure timeslots 1 to 10 as B Channels.

The PRI Logical Lines window automatically appears. Accept the default values.

Demand Pool Configuration

Configure the demand pool. Select Dialup > Demand Pools from the main menu bar.

Table A-10. Demand Pools

Parameter Name	Router 1 (MCT1-2)	Router 2 (ISDN1)
Pool ID	1	1

After entering a demand pool ID, the Demand Lines Definition window appears automatically. Click on either the MCT1-2 connector (Router 1) or the ISDN1 connector (Router 2). Site Manager automatically displays the ISDN Switch Configuration window.

Path: Demand Lines Definition window > ISDN Switch Configuration window

Table A-11. Switch Configuration Parameters

Parameter Name	Router 1 (MCT1-2)	Router 2 (ISDN1)
Switch Type	PRI 5ESS	NI1

The ISDN Logical Lines window appears after the ISDN Switch Configuration window. Accept the default values.

Demand Circuit Configuration

Once the demand pool is configured, the next step is to configure demand circuits. Select Dialup > Demand Circuits from the menu bar.

Path: Demand Circuits > Demand Circuits window

Table A-12. Demand Circuit Parameters

Parameter Name	Router 1 (MCT1-2)	Router 2 (ISDN1)
CHAP Local Name	BLN (case-sensitive)	ASN (case-sensitive)
CHAP Secret	ISDN (case-sensitive)	ISDN (case-sensitive)
Connection Mode	Default (Collision Master)	Collision Slave

Outgoing Phone List

From the Demand Circuits window, click on Phone Out to access the Outgoing Phone List window.

Path: Outgoing Phone List window > Phone Number window

Table A-13. Outgoing Phone List Parameters

Parameter Name	Router 1 (MCT1-2)	Router 2 (ISDN1)
Phone Number	4364444 (Do not use hyphens or other non-numeric characters.)	4366666 (Do not use hyphens or other non-numeric characters.)
Note: The ISDN Numbering Plan and ISDN Numbering Type parameters default to the correct settings based on the switch type you configured. Do not change these parameters unless you receive explicit instructions from your service provider.		

Protocol Configuration

Once you return to the Demand Circuits window from the Outgoing Phone List window, select the protocol for this application. The Protocols button is located at the top left corner of the Demand Circuits window.

Path: Protocols > Select Protocols window

Table A-14. IP Parameters

Protocol	Router 1 (MCT1-2)	Router 2 (ISDN1)
IP Address	132.132.132.3	132.132.132.1
Subnet Mask	255.255.255.0	255.255.255.0

Path: IP Configuration window > IP Adjacent Host window

Table A-15. IP Adjacent Host Parameter

Protocol	Router 1 (MCT1-2)	Router 2 (ISDN1)
IP Address	132.132.132.1	132.132.132.3

Caller Resolution Table Configuration

After configuring the demand circuits, configure the Caller Resolution Table. Select Dialup > Caller Resolution Table.

Path: Caller Resolution Table > Caller Name and Secret/Password window

Table A-16. Caller Resolution Parameters

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Caller Name	ASN	BLN
CHAP Secret	ISDN	ISDN

Path: Caller Name and Secret/Password > Local Circuit List window

The configured circuits are listed in the Local Circuit List window. Choose the demand circuit you created earlier.

Local Phone Number Configuration

Finally, configure each router's phone number. Select Dialup > Local Phone Numbers. Site Manager displays the ISDN Local Phone Lines window.

Path: ISDN Local Phone Numbers > Phone Number window

Table A-17. Local Phone Number Parameters

Parameter	Router 1 (MCT1-2)	Router 2 (ISDN1)
Directory Number	4366666	4364444
SPID	N/A	50843644440000
Note: No SPID is needed for a PRI line. A SPID is needed for a BRI line using an NI1 switch.		

Dial Backup with PPP on the Primary Line

Figure A-3 shows Routers 1 and 2 connected via a synchronous line running PPP. You designate this synchronous connection as a primary connection, so if it fails, the router provides a dial backup connection.

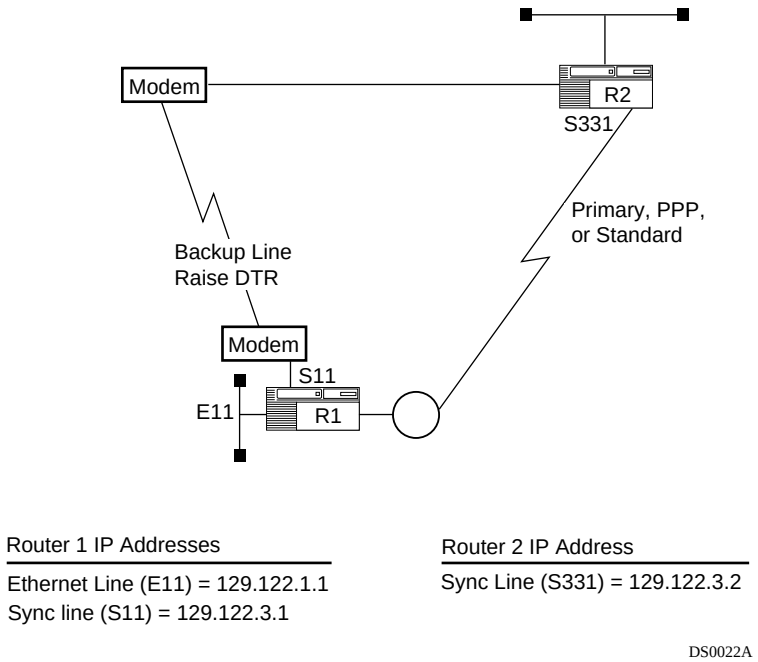


Figure A-3. Dial Backup Configuration with PPP

Configuration of Router 1

To configure Router 1:

1. **Configure a leased, synchronous interface named S11.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   a. **IP Address: 129.122.3.1**
   b. **IP Adjacent Host Address: 129.122.3.2**
4. **From the Configuration Manager window, click on a COM connector.**
5. **Follow the path of configuration windows and set the parameters according to Tables A-18 through A-22.**

Configuration of Router 2

To configure Router 2:

1. **Configure a leased, synchronous interface named S331.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   a. **IP Address: 129.122.3.2**
   b. **IP Adjacent Host Address: 129.122.3.1**
4. **From the Configuration Manager window, click on a COM connector.**
5. **Follow the path of configuration windows and set the parameters according to Tables A-18 through A-22.**

Note: The tables show only parameters whose default settings change.

Backup Pool Configuration

First, configure the backup pools. Select Dialup > Backup Pools from the main menu bar.

Table A-18. Backup Pool Parameters

Parameter Name	Router 1 (S11)	Router 2 (S331)
Pool ID	1	1

After entering a backup pool ID, the Backup Lines Definition window appears. Click on a COM connector. Site Manager displays the WAN Serial Interface Type window, where you determine whether you want to use Sync or Async communication. Sync is the default, so no changes are needed.

Next, Site Manager displays the Line Media Type window. In this application, Raise DTR, the default, is the signaling method, so no changes are needed. After you configure the line media parameters, return to the Configuration Manager window.

Backup Circuit Configuration

Once the backup pool is configured, configure the backup circuits. Select Dialup > Backup Circuits from the main menu bar.

Remember that you do not specifically configure a backup circuit. You are actually designating a leased circuit as a primary circuit. If this circuit fails, the router provides a backup circuit that adopts the configuration of the primary.

Path: Primary Circuit Definition window (highlight S11 or S331 -- click on Cct Type) > Circuit Options window

Table A-19. Circuit Options Parameters

Parameter Name	Router 1 (S11)	Router 2 (331)
Circuit Type	Primary	Primary
Backup Pool ID	1	1

Return to the Primary Definition window from the Circuit Options window.

Path: Circuit Options window > Primary Circuit Definition window

Table A-20. Primary Circuit Definition Parameters

Parameter Name	Router 1 (S11)	Router 2 (S331)
Backup Mode	Master (default)	Slave
CHAP Local Name	BLN	N/A
CHAP Secret	West	N/A

Outgoing Phone List Configuration

From the Primary Circuit Definition window, click on Phone Out to access the Outgoing Phone List window.

Path: Outgoing Phone List window > Phone Number window

Table A-21. Outgoing Phone List Parameters

Parameter Name	Router 1 (S11)	Router 2 (S331)
Phone Number	4362222 (Do not use hyphens or other non-numeric characters.)	4368888 (Do not use hyphens or other non-numeric characters.)

Caller Resolution Table Configuration

Router 1, the master router, does not require a caller resolution table. It initiates calls to Router 2, it does not receive them. Consequently, Router 1 does not need to verify the identity of Router 2. In contrast, Router 1 must have a CHAP name and CHAP secret that it places in the call setup message to identify itself to Router 2.

Router 2, the slave router, does require a table entry. Router 2 receives calls from Router 1 and must identify the incoming caller. After configuring the primary/backup circuits, you can configure the caller resolution table. Select Dialup > Caller Resolution Table.

Path: Caller Resolution Table > Caller Name and Secret/Password window

Table A-22. Caller Resolution Parameters (Router 2 Only)

Parameter	Router 1 (S11)	Router 2 (S331)
Caller Name	N/A	BLN
CHAP Secret	N/A	West

Dial Backup with Standard on the Primary Line

If the primary circuit uses Standard as the WAN protocol (refer to Figure A-3), you must configure a unique value for the MAC Address parameter of the primary IP interface. The router then uses this address as the value of the MAC Address parameter in the IP adjacent host entry for the remote router. Routers on each end of the connection require an IP adjacent host entry that includes the other router's MAC address.

Refer to the previous section for how to configure most dial backup parameters with the exception of the IP parameters shown in Tables A-23 and A-24.

Table A-23. IP Parameters

Parameter Name	Router 1 S11 (129.122.3.1)	Router 2 S331 (129.122.3.2)
MAC Address	0x000000000001	0x000000000002

Table A-24. IP Adjacent Host Parameters

Parameter Name	Router 1 S11 (129.122.3.1)	Router 2 S331 (129.122.3.2)
IP Address	129.122.3.2	129.122.3.1
Next Hop Interface Addr	129.122.3.1	129.122.3.2
MAC Address	0x000000000002	0x000000000001

Dial Backup over an ISDN Network

Figure A-4 shows dial backup service in an ISDN network. In this configuration, the primary circuit is using PPP. At the end of this section, there are configuration notes if the application uses Standard or Frame Relay protocols.

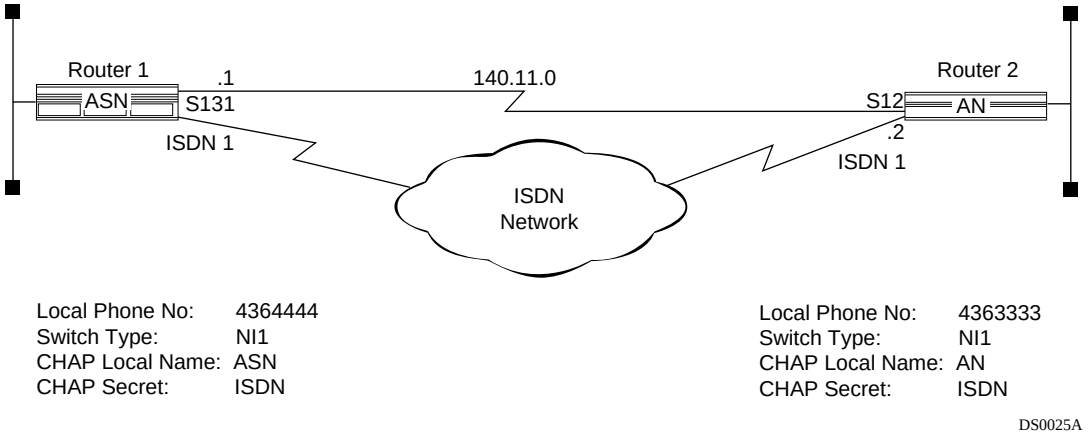


Figure A-4. Dial Backup in an ISDN Network

Configuration of Router 1

To configure Router 1:

1. **Configure a leased, synchronous interface named S131.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   a. **IP Address: 140.1.1.1**
   b. **Subnet Mask: 255.255.255.0**
   c. **IP Adjacent Host Address: 140.1.1.2**
4. **From the Configuration Manager window, click on an ISDN1 connector.**
5. **Follow the path of configuration windows and set the parameters according to Tables A-25 through A-32.**

Configuration of Router 2

To configure Router 2:

1. **Configure a leased, synchronous interface named S12.**
2. **Select PPP as the WAN protocol.**
3. **Select IP/RIP as the LAN protocol and configure the interface as follows:**
   a. **IP Address: 140.1.1.2**
   b. **Subnet Mask: 255.255.255.0**
   c. **IP Adjacent Host Address: 140.1.1.1**
4. **From the Configuration Manager window, click on an ISDN1 connector.**
5. **Follow the path of configuration windows and set the parameters according to Tables A-25 through A-32.**

Note: The tables show only parameters whose default settings change.

Port Application Mode Configuration

First, configure the port application mode.

Path: ISDN1 connector > Port Application window

Table A-25. Port Application Mode

Parameter Name	Router 1 (S131)	Router 2 (S12)
Port Application Mode	Default (Dialup - 2B + D)	Default (Dialup - 2B + D)

Backup Pool Configuration

Configure the backup pools. Select Dialup > Backup Pools from the menu bar.

Table A-26. Backup Pools

Parameter Name	Router 1 (S131)	Router 2 (S12)
Pool ID	1	1

After entering a backup pool ID, the Backup Lines Definition window appears. Click on the ISDN1 connector. Site Manager automatically displays the ISDN Switch Configuration window.

Path: Backup Lines Definition window > ISDN Switch Configuration window

Table A-27. Switch Configuration Parameters

Parameter Name	Router 1 (S131)	Router 2 (S12)
Switch Type	NI1	NI1

The ISDN Logical Lines window appears after the ISDN Switch Configuration window. Accept the default parameter settings.

Backup Circuit Configuration

Once the backup pool is set, configure backup circuits. Select Dialup > Backup Circuits from the main menu bar.

Remember that you do not specifically configure a backup circuit. You are actually designating a leased circuit as a primary circuit. If this circuit fails, the router provides a backup circuit that adopts the configuration of the primary.

Path: Primary Circuit Definition window (highlight S131 or S12 -- click on Cct Type) > Circuit Options window

Table A-28. Circuit Options Parameters

Parameter Name	Router 1 (S131)	Router 2 (S12)
Circuit Type	Primary	Primary
Backup Pool ID	1	1

Return to the Primary Definition window from the Circuit Options window.

Path: Circuit Options window > Primary Circuit Definition window

Table A-29. Primary Circuit Definition Parameters

Parameter Name	Router 1 (S131)	Router 2 (S12)
Backup Mode	Master	Slave
CHAP Local Name	ASN	N/A
CHAP Secret	ISDN	N/A

Outgoing Phone List

From the Primary Circuit Definition window, click on Phone Out to access the Outgoing Phone List window.

Path: Outgoing Phone List window > Phone Number window

Table A-30. Outgoing Phone List Parameters

Parameter Name	Router 1 (S131)	Router 2 (S12)
Phone Number	4363333 (Do not use hyphens or other non-numeric characters.)	4364444 (Do not use hyphens or other non-numeric characters.)
Note: The ISDN Numbering Plan and ISDN Numbering Type parameters default to the correct settings based on the switch type you configured. Do not change these parameters unless you receive explicit instructions from your service provider.		

Caller Resolution Table Configuration

Router 1, the master router, does not require a caller resolution table. It initiates calls to Router 2, it does not receive them. Consequently, Router 1 does not need to verify the identity of Router 2. In contrast, Router 1 must have a CHAP name and secret that it places in the call setup message to identify itself to Router 2.

Router 2, the slave router, does require a table entry. Router 2 receives calls from Router 1 and must identify the incoming caller. After configuring the backup circuits, you can configure the caller resolution table. Select Dialup > Caller Resolution Table.

Path: Caller Resolution Table > Caller Name and Secret/Password window

Table A-31. Caller Resolution Parameters (Router 2 Only)

Parameter	Router 1 (S131)	Router 2 (S12)
Caller Name	N/A	ASN
CHAP Secret	N/A	ISDN

Local Phone Number Configuration

Finally, configure each router's phone number. Select Dialup > Local Phone Numbers. Site Manager displays the ISDN Local Phone Lines window.

Path: ISDN Local Phone Numbers > Phone Number window

Table A-32. Local Phone Number Parameters

Parameter	Router 1 (S131)	Router 2 (S12)
Directory Number	4364444	4363333
SPID	50843644440000	50843633330000
Note: A SPID is needed for a BRI line using an NI1 switch.		

Configuring Dial Backup with Standard or Frame Relay

If the primary circuit uses Standard as the WAN protocol, you must configure a unique value for the MAC address field of the primary IP interface. The router then uses this address as the value of the MAC Address parameter in the IP adjacent host entry for the remote router. Routers on each end of the connection require an IP adjacent host entry that includes the other router's MAC address.

If the primary circuit uses Frame Relay (in direct mode, using A-bit notification) as the WAN protocol, you do not need to configure the MAC address of the primary IP interface, but you still need to configure an IP adjacent host entry for both routers.

Appendix B
Dial Services Default Settings

Tables B-1 through B-16 give the default settings for Dial Services. Use the Configuration Manager to edit any of the default settings listed here.

Table B-1. Line Pool Parameters

Parameter	Default
Demand Pool ID	None
Backup Pool ID	None
Bandwidth-on-Demand Pool ID	None
WAN Serial Interface Type	Sync

Table B-2. Line Media Type Parameters

Parameter	Default
Line Media Type	Raise DTR
Cable Type	RS232
Priority	1
Modem Command String	None

Table B-3. Modem Interface Parameters

Parameter	Default
Retry Delay	3 seconds
Redial Count	3 attempts
Ring Indicator	Enable
Debug Mode	Disable
Modem Command String	None

Table B-4. Port Application Mode Parameters

Parameter	Default
Port Application Mode (BRI)	Dialup - 2B + D
Port Application Mode (PRI)	NonPRI

Table B-5. Logical Lines Parameter

Parameter	Default
MTU Size	1600 bytes

Table B-6. ISDN Switch Parameters

Parameter	Default
Switch Type	BRI NET3 or PRI Net 5
Incoming Filter	Disable
Sending Complete IE	Disable
Data Rate	64K

Table B-7. ISDN Logical Lines Parameters

Parameter	Default
Pool Channel Count	Available B channels
Pool Channel Priority	1

Table B-8. Local Phone Number Parameters

Parameter	Default
Directory Number	None
Ext/SubAddr	None
Spid	None
Assigned Channel	None
Directory Number Type	Unknown
Directory Number Plan	Unknown

Table B-9. BRI Interface Parameters

Parameter	Default
Acceptable LAPD MTUs	400 bytes
BRI T3 Timer	10 seconds
BRI T4 Timer	750 milliseconds
BRI B Channel Loopback	Disable
BRI Line Type	PTP

Table B-10. Demand Circuit Parameters

Parameter	Default
Demand Pool ID	None
Force Take Down	Disable
Force Dial	Disable
Inactivity Time	60 seconds
Retry Max	2 attempts
Retry Delay	3 seconds
Connection Mode	Collision Master
Auto Demand Termination	Disable
Auto Demand Term. Reset	60 minutes
CHAP Local Name	None
CHAP Secret	Unsecured
PAP Local ID	None
PAP Password	Unsecured
Maximum Up Time	60 minutes
Max UpTime Termination	Disable
UpTime Term. Reset	60 minutes
Days	Weekday
Start Time	0
End Time	2359
Inactivity Timeout	Disable
Minimum Call Duration	60 seconds
Inactivity Mode	Both Direction
Dial Optimized Routing	Disabled
Outbound Authentication	Enable

Table B-11. Demand Circuit Group Parameters

Parameter	Default
Pool ID	None
Number of Circuits	None
Caller Name	Unsecured
CHAP Secret	None
PAP Password	None
IP Enable	Disable
Associated IP Address	None
RIP Enable	Disable
OSPF Enable	Disable
IPX Enable	Disable
IPX Routing Protocol	RIP/SAP
IPXWAN Enable	Disable
Bridge Enable	Disable

Table B-12. Primary/Backup Circuit Parameters

Parameter	Default
Circuit Type	Normal
Backup Pool ID	None
Backup Mode	Master
CHAP Local Name	None
CHAP Secret	Unsecured
PAP Local ID	None
PAP Password	Unsecured
Maximum Up Time	60 minutes
Max UpTime Termination	Disable
UpTime Term. Reset	60 minutes
Interface Type	Normal
Primary Down Time	5 minutes
FR Service Control	Disable (Primary/Secondary) Enable (Primary/Shared)
Hangup on DLCMI Failure	Disable
Service Name	None
Days	Weekday
Start Time	0
End Time	2359
Outbound Authentication	Enable

Table B-13. Bandwidth-on-Demand Circuit Parameters

Parameter	Default
Circuit Type	Normal
BOD Pool ID	None
Bandwidth Mode	Non-monitor
CHAP Local Name	None
CHAP Secret	Unsecured
PAP Local ID	None
PAP Password	Unsecured
PPP Circuit Mode	Normal
BOD Exam Period	10 (0.10-second intervals)
BOD Fail Threshold	70 percent
BOD Periods to Fail	10 times
Preferred Bandwidth Slot	None
Reserved Bandwidth Slot	None
Maximum Links	4
BOD Recovery Threshold	20 percent
BOD Periods to Recover	10 times
Multilink Fragmentation	Permitted
Fragmentation Trigger Size	256
Outbound Authentication	Enable

Table B-14. Outgoing Phone List Parameters

Parameter	Default
Phone Number	None
Phone Ext/SubAddr	None
Phone Delimiter	None
Phone Number Type	ISDN
ISDN Numbering Type	Unknown
ISDN Numbering Plan	Telephony
Adaption Rate	64K
Remote Pool Type	Dial and Bandwidth-on-Demand
Connection Type	Multiple
Channel Bandwidth Type	BChannel
Aggregate Bandwidth	128K (2*64K)

Table B-15. Incoming Phone List Parameters

Parameter	Default
Phone Number	None
Phone Ext/SubAddr	None

Table B-16. Caller Resolution Table Parameters

Parameter	Default
Local Circuit	None
Caller Name	None
CHAP Secret	Unsecured
PAP Password	Unsecured
Local Group	0

Appendix C
Ordering ISDN Lines in the United States

Follow the guidelines in this appendix for ordering ISDN BRI and PRI lines.

Ordering BRI Lines

When ordering ISDN BRI lines for use in the United States, note the following:

- Configure the B1 and B2 channels for data only.
- Configure the D channel for signaling only.

Table C-1 lists the parameters to set for AT&T 5ESS switches. Table C-2 lists the parameters to set for Northern Telecom DMS-100 switches. Your phone company might ask you to provide this information when you order your BRI lines.

Table C-1. BRI Parameters for AT&T 5ESS

Parameter	Value	Notes
Terminal Type	A	
Number of CSD	2	
Number of CSV	0 or 1	1 if an ISDN phone was connected to the S/T bus
Number of call appearances	1	
Display is Y/N	No	
Ringing/Idle Call Appearances	Idle	Default for terminal type A
Autohold is Y/N	No	Default for terminal type A
Onetouch is Y/N	No	Default for terminal type A

Table C-2. BRI Parameters for Northern Telecom DMS-100

Parameter	Value	Notes
Signaling	Functional	
Protocol Version	1 or 2	1 is NT1 Custom, 2 is NI-1 (National ISDN-1)
TEI Assignment	Dynamic	
Maximum # of Keys	3	Any number equal to or greater than 1 will work
Release Key is N or a Key Number	No	Not relevant for proper operation
Ring Indicator is Y/N	No	Not relevant for proper operation
EKTS is Y/N	No	

Ordering PRI Lines

When ordering ISDN PRI lines for use in the United States, note the following:

- The switch must be a DMS-100, AT&T 5ESS, or AT&T 4ESS switch.
- Configure all 23 B channels for Circuit Switched Data (CSD).
- Configure the D channel for signaling only.
- You cannot run the National ISDN-2 (NI-2) protocol.

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